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The contract for the new Jersey City water supply has again been awarded by the Board of Street and Water Commissioners to the Jersey City Water Co., but with the certainty that the Board of Finance will again refuse to concur in the award. The Street and Water Commissioners have also awarded a contract for a temporary supply to the East Jersey Water Co., water to be taken from the surplus in the Newark pipe line. The latter company's bid for a temporary supply, however, was conditioned on its receiving the contract for a permanent supply. The Board has also voted to consult with Mr. C. C. Vermuele, the engineer for one of the informal bidders last spring, to see whether he will serve as engineer for the city during the construction of the works. The Finance Board has publicly stated that it will not concur in the award on the ground that the decision between the different bidders cannot be properly made, except on the advice of an expert engineer employed for that purpose by the city. The bids were given in detail in our issues of July 4 and 11, 1895, and further discussed in our last issue. The award was made on the basis of a daily supply of 50,000,000 gallons, delivered through one pipe line, and with a storage capacity for 250 days' supply. The accepted bid is $2,300,000 above that of the lowest bidder. The matter is discussed in our editorial columns.

Camden, N. J., proposes to follow the example of Newark and Jersey City in obtaining a new water supply by contract. It is now advertising for bids, to be opened on Sept. 3, for a supply of 20,000,000 gallons a day, as stated in detail in our advertising columns. This supply must be delivered to the present distributing system. This method of securing a new water supply appears to be peculiar to New Jersey cities, most, if not all, other states preferring to either secure the necessary water rights and build the several parts of the works by contract or day's work, or else to turn over the distribution of water, as well as the furnishing of it to the city mains, to a private company. It is expected that the private interests which for some time have been trying to sell water to Philadelphia will bid for the Camden contract.

Bad water from the storage reservoir of the waterworks of Middletown, Conn., is giving the people and authorities of that city much trouble this summer. Doubtless a large area of shallow flowage contributes to the trouble, but it is stated that the reservoir bottom over this area has been thoroughly cleaned of organic matter and that the principal growths are in the deep water. Recently last year's growth has been coming to the surface in a partially decayed state. The prevailing southerly winds drive this matter to the dam in large quantities, thus affecting the water as it enters the supply main. Within a year, the Water Commissioners state in a recent report to the City Council, some 800 cartloads of "weeds" were removed from the reservoir. It is expected that work will soon have to be started on removing the growth of this season. From April to June of the present year an organism developed and gave some trouble which the commissioners say was "Uroglena Volvox." (For description of various forms of "Uroglena," with beautiful colored plates, see article by Gary N. Calkins in the Report of the Massachusetts State Board of Health for 1891, pp. 645-58.) This interesting organism seems to develop its objectionable qualities just before reaching the consumers rather than in the reservoirs, which may be due to the fact, so far as any facts have been ascertained, that it gives off odors, not on account of decay, but during a process of disintegration of the colonies, while the water containing the organism is passing through the pipes. Mr. Geo. H. Bishop, an engineer of Middletown, has recommended that the water be treated by mechanical filtration. The question of stripping reservoir sites is discussed in our editorial columns.

The project for a so-called steel water tunnel for Cleveland is again being revived. This is really nothing more nor less than a long submerged steel intake pipe, instead of the tunnels beneath the lake bottom common to the cities on the Great Lakes. In our issue of March 19, 1892, there was described and illustrated a proposed scheme for laying 2½ miles of 8½-ft. steel intake pipe, the pipe to be made up in long sections on the shore, floated out to line, joined up, and then sunk all at once by admitting water through valves in the bottom of the pipe. It is now proposed to push the pipe out from the shore as fast as constructed, but just how is not stated. Mr. Robt. Powell, Superintendent of the Powell Wire Nail Machine Co., of Cleveland, devised the former scheme.

A contract has been awarded to the King Bridge Co., of Cleveland, O., for the erection of a lift bridge over Newtown Creek, in Brooklyn, for the sum of $418,000, the structure to be similar to the Halsted St. lift bridge in Chicago, designed by J. A. L. Waddell, and illustrated in our issue of April 19, 1894. The award may yet be vetoed by the Supervisor-at-Large, and it is being vigorously opposed by Supervisor Linnekin and others in the public prints. They charge that the price named is excessive, that the bridge can easily be built for $250,000, that the Halsted St. bridge in Chicago was built for $200,000, and that the high price of $418,000 is due to a combination or pool among the several bidders, by which all except the King Bridge Co. agreed to put in higher bids than that company in consideration of sharing its profits. Supervisor Linnekin states that the County Engineer drew plans for the substructure only, and not for the superstructure, and put in his specifications a clause requiring each bidder to put in his own plans for the superstructure. The bids were advertised for only 13 days, which was too short a time for many builders to prepare their plans, and the competition was thus restricted. In connection with the statement made above, that the Halsted St. bridge at Chicago cost $200,000, the following quotation from Mr. Waddell's paper, describing this bridge, published in "Trans. Am. Soc. C. E.," Jan., 1895, is of interest:

> If a contract for building a duplicate of the Halsted St. lift bridge were to be let to-day, at present prices, with close competition, and if the engineer were allowed full sway in making plans and specifications for substructure, superstructure, approaches and machinery, based upon correct data, it is not too much to say that the entire cost could be reduced to, at most, $150,000, instead of $200,000, which is about what the structure itself at Halsted St. really cost, exclusive of outside extras.

The award, by the Buffalo City Council, of the contract for a 30,000,000-gallon pumping engine, to the highest bidder, commented upon in our last issue, has been rescinded by the Council, after veto by the Mayor. The Council has passed a resolution declaring the last bids illegal, owing to technical defects in advertising, rejecting all the bids, and authorizing the Board of Public Works to call for new proposals for a 30,000,000-gallon vertical triple expansion engine. The Board is also authorized to employ an expert mechanical engineer if it sees fit, to prepare plans and specifications for the engine.

The most serious railway accident of the week was a head collision near Plymouth, N. H., on Aug. 8 between the "Cannon-ball" express on the Boston & Maine R. R. and an extra freight train. Three persons were killed and many seriously injured. The collision is said to have been due to a misunderstanding of orders by the engineer of the freight train.

A bridge failed under a coal train of the Ohio Southern R. R. at Paint River, 40 miles south of Springfield, O., on Aug. 10. The engineer, fireman and a brakeman were drowned, and it is reported that four tramps who were stealing a ride also were drowned. It is reported that the cause of the wreck was that the bridge had caught fire and had burned almost in two before the train struck it.

The sinking of the "Elbe" in the North Sea in January last has been investigated by the British Admiralty Court, which has rendered a decision against the owners of the steamer "Crathie," by which vessel the "Elbe" was sunk. The court found that the mate of the "Crathie" was guilty of quitting the bridge before the collision without adequate reason. The chief officer of the watch on the "Elbe" was censured also for neglecting to shift his helm and to use his steam signals.

A 12 × 150-ft. wrought iron stand-pipe at El Dorado, Kan., is reported as "blown down" by a severe wind on the night of Aug. 10-11. It is said that the structure broke about 10 ft. from the bottom, and that no serious damage was done. The water-works at El Dorado, and doubtless the stand-pipe, were built in 1887.

Regulations in regard to the crossing of electric railways at grade have been issued by the Maine Central R. R. At every crossing where there is a signal post, a red ball or red light at the top of the post requires all trains to stop before reaching the crossing, and the watchman must hoist the ball or light before any electric car crosses, whether a train is due or not. Gates must be lowered and flags shown as if no signal were used, and when a train is approaching or expected, great caution must be exercised not to let a car or team on the crossing unless there is ample time to cross without stopping the train. All trains must approach such crossings under control, and be ready to stop if the signal is displayed.

An express engine with a single pair of driving wheels and Vauclain compound cylinders has been recently built for the Atlantic City service of the Philadelphia & Reading R. R. by the Baldwin Locomotive Works. The engine has a four-wheel leading truck and a single pair of large trailing wheels. The boiler is of the Wootten type, with the cab at the junction of the firebox and the cylindrical part of the boiler and the dome behind the cab. The driving springs are under the axle boxes, and are equalized with the underhung springs of the trailing wheels, and the exhaust nozzle is near the bottom of the smokebox, with a petticoat pipe extending up to near the base of the stack. An ordinary eight-wheel tender is used. The principal dimensions are as follows:

Driving wheels, diameter	7 ft. ¼ in.
Wheelbase, truck	7 " 0 ins.
" c. of rear truck axle to driv. axle	8 " 9 "
" " " driving axle to trailing "	7 " 0 "
" total	22 " 9 "
Weight on driving wheels	48,000 lbs.
" " truck	39,000 "
" " trailing axle	28,000 "
" total	115,000 "
Cylinders	h. p., 13 × 26 ins.; l. p., 22 × 26 ins.
Boiler, diameter	4 ft. 8 "
" pressure	200 lbs.
Firebox	9 ft. 6 ins. × 8 ft.
Tubes, number	324
" diameter	1½ ins.; length, 10 ft. 3 ins.
Height to top of smokestack	14 " 3 "

The sewage of Vassar College, at Poughkeepsie, N. Y., will be disposed of hereafter by broad irrigation on land located some distance from the college, which has been bought for this purpose. Noyes & Hazen, of Boston, are the engineers who recommended the change and have the work in charge. The sewage has been discharged into settling tanks, from which the effluent flowed into Casparkill Creek. Complaints have recently been made that the creek was being badly polluted, and the college authorities have undertaken the change of system, as above noted.

The relation between the sewage precipitation works of Worcester and the Blackstone River is to be investigated by Mr. Allen Hazen, of Noyes & Hazen, Boston, for the town of Millbury, on the river below Worcester. The Worcester works were built practically by order of the Massachusetts legislature upon complaint of the people on the river below, though the system of purification was not specified. Millbury is the nearest town, and claims that the river is still badly polluted. The city is now considering, not for the first time, the separation of the sewage from the water of Mill Brook, all of which latter must be treated, unless some of the sewage goes with it to the river without purification.

The final disposition of the garbage, ashes and street sweepings of New York city was the subject of a resolution introduced in the Board of Estimate and Apportionment on Aug. 1, by Mayor Strong. The resolution, which was referred to a committee consisting of Mayor Strong and President Jeralomon, of the Board of Aldermen, called upon the Commissioner of Street Cleaning to present to the Board a form inviting proposals for: The collection and final disposition of (1) ashes, garbage and sweepings; (2) ashes and garbage; (3) garbage alone. Also for the final disposition of garbage. The resolution states that the garbage must be separated from the other matter and may be treated by any sanitary and efficient process; also that the contract shall be for not less than five years. It is reported that as the law now stands the city has authority to contract for disposal by cremation, but not by any of the utilization processes.

HEAVY EXPRESS LOCOMOTIVE, FITCHBURG R. R.

We illustrate this week a well-designed passenger locomotive recently built for fast express service on the Fitchburg R. R. by the Schenectady Locomotive Works. The engine is of the eight-wheel type, with large driving wheels and large boiler capacity, being intended for fast running with heavy trains on a line having some severe grades. The boiler has a very long wagon top, and in its fittings there is a marked simplicity of outline, while the short cylindrical smokestack and the casing for the safety valve and whistle attract some attention. Bituminous coal is used for fuel. The cab is of sheet iron, and the indications seem to be that this type of cab will very largely supersede the wooden cab. The cylinders are 20 × 24 ins., fitted with four-bar guides, and the driving wheels are 6 ft. 1 in. diameter on the tread, with springs hung below the axle boxes. The connecting and coupling roads are of I-section, and the latter have solid ends. The reciprocating parts have apparently been designed especially with a view to saving weight, judging from the appearance of the counterbalances. The tender trucks have Fox pressed steel frames, with helical springs directly over the boxes. The Westinghouse-American brake is fitted to the front face of the driving wheels and to all the tender wheels, while brake hose for coupling to the train brakes are provided at the front of the engine and rear of the tender. Among the minor details to be noted are the short pilot and automatic coupler in front of the bumper beam, the circular form of the headlight and the Leach steam-sanding device. We are indebted to the builders for the photograph from which our illustration is made, and for the following list of dimensions (given in our standard form):

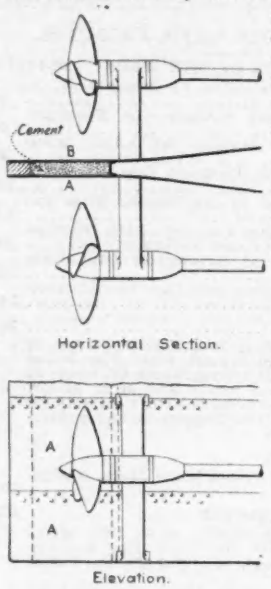
Dimensions of Passenger Locomotive; Fitchburg R. R.

Running Gear—	
Driving wheels, diameter	6 ft. 1 in.
Truck " "	2 " 9 ins.
Tender " "	3 " 0 "
Engine truck	Rigid center.
Journals, driving axles	8½ × 11 ins.
" truck axles	6 × 10 "
" tender axles	4¼ × 8 "
Wheel Base—Driving	8 ft. 6 "
Truck	6 " 8 "
Total engine	23 " 5 "
" tender	15 " 6 "
" engine and tender	48 " 1 in.
Center of truck pin to c. of lead'g driver.	11 " 7 ins.
Form of crosshead and guides	Four-bar
Connecting rod, length between centers	7 ft. 7½ ins.
Valve Gear—Type	Stephenson link.
Ports, steam	1⅞ × 20 ins.
" exhaust	3 × 20 "
Slide valves	Allen-Richardson
" " lap, inside	0; outside, 1⅛ ins.
" " maximum travel	6 "
" " lead, full-gear forward	1-16 in.
" " lap, full-gear backward	¼ "
Boiler—Type	Extended wagon top.
Diam. of barrel inside	5 ft. 1 in.
Thickness of barrel plates, 1st ring	⅝ "
Thick. of bar'l plates, taper ring & 3d ring	11-16 "
" " smokebox tube plate	9-16 "
Height from rail to center line	8 ft. 4¾ ins.
Length of smokebox (from tube sheet)	5 " 5½ "
Working steam pressure	190 lbs.
Firebox—Type	Radial stay.
Length inside	8 ft. 3-16 in.
Width "	3 " 4¾ ins.
Depth at front	6 " 2¼ "
" " back	5 " 2¼ "
Thickness of side and back plates	5-16 in.
" " crown sheet	⅜ "
" " tube sheet	½ "
Grate area	26.96 sq. ft.
Staybolts, diameter	1 in.; pitch about 3¾ ins.
Water space, width, front	4; sides, 3½; back, 3 ins.
Tubes—Material	Franklinite, No. 11 gage.
Number	320; pitch, 2¾ ins.
Diam. inside	1¾ ins.; outside, 2 ins.
Length over tube plates	11 ft. 6 ins.
Heating Surface—	
Tubes, exterior	1,912.00 sq. ft.
Firebox	154.86 " "
Total, with exterior tube area	2,066.86 " "
Miscellaneous—	
Exhaust nozzle, diameter	4⅞, 5 and 5⅛ ins.
Smokestack, smallest diameter	1 ft. 4 "
" height from rail to top	14 " 4 "
Capacity of tank (gallons of 231 cu. ins.)	4,000 gals.
" " coal space	14,000 lbs.
Brake fittings	Westinghouse-American.
Tractive force per lb. effect. press. on pis.	131.51 lbs.

THE ACCIDENT TO THE STEAMER " LA TOURAINE."

An unusual and somewhat mysterious accident happened to the French twin-screw steamer "La Touraine" on her last voyage from Havre to New York, where she arrived on Aug. 4. On Wednesday, July 31, about 4 p. m., a heavy jar was felt in the after part of the steamer. The engines were stopped and an examination was made, and it was found that some of the plates of the hull sheathing immediately forward of the stern post and directly opposite the screw on the port side had been loosened and cracked, and were bulging outward to such an extent that the port screw struck against them at every revolution. It was found that the screw on the starboard side would move clear of all obstructions, and the steamer proceeded on her way with the starboard engine alone for 30 hours, when it was found that the port screw was then clear of the bulging plates,and the vessel finished her voyage with both engines. After discharging her cargo the vessel was docked at the Erie Basin, where repairs were made.

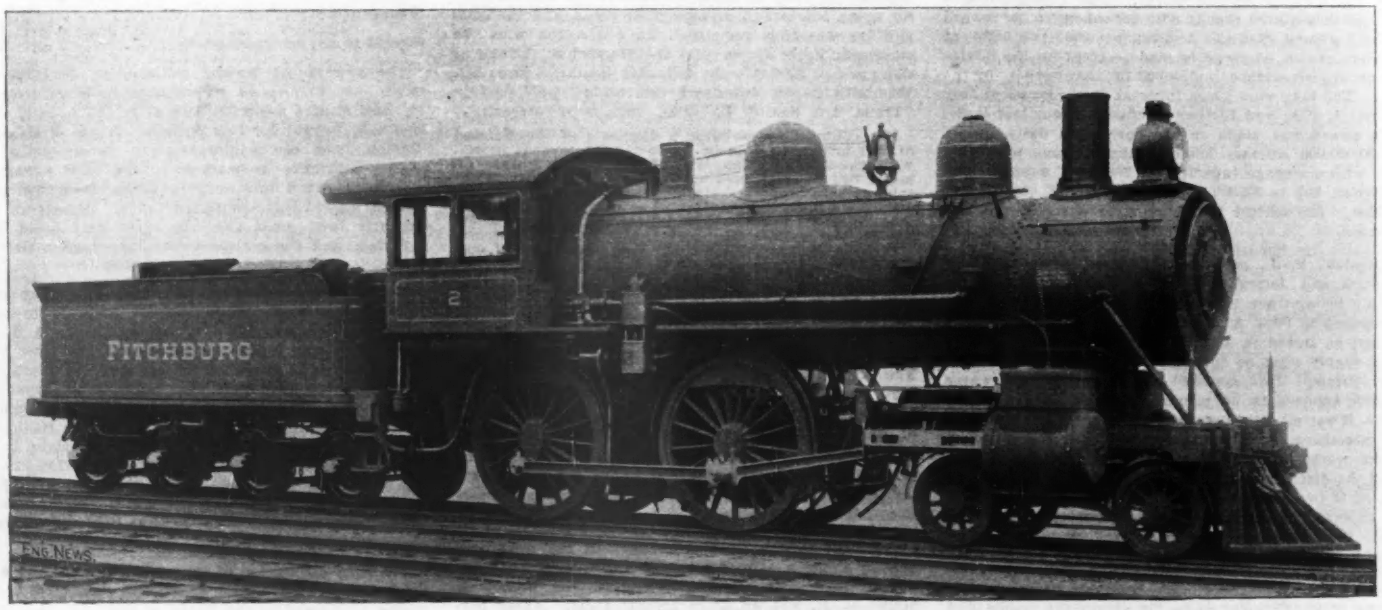
The character of the accident may be clearly understood from the accompanying sketches. "La Touraine" has an exceedingly fine "run," or after body, beneath the water line, so fine, in fact, that the sheathing plates of the hull on the port and starboard sides come so close together at a point about 6 ft. forward of the stern post, and for a distance from the keel upwards of about 10 ft. that they are parallel with each other and only about 8 ins. apart, being separated this distance at the extreme end by the thickness of the stern post, and at a vertical line 5 ft. forward of the stern post by the width of a channel bar, to which the plates are riveted. This portion of the hull—viz., a space about 10 ft. high by 5 ft. fore and aft—is directly between the two screws, the after bearings of which are held at their proper distance from the vessel by heavy brackets bolted to the keel and to the frame just forward of the screw and of the portion of the keel which we have described. The space about 8 ins. wide between the plates of the two sides, and extending from the stern post to the vertical channel bar was filled with a cement concrete.



Sketch of the Stern of La Touraine; A B Plates Fractured.

As seen when the vessel was dry-docked, the plates on both the port and starboard sides were cracked and bulged outward, and many of the rivets were missing. Both of the propellers showed at the tips of their bronze blades dents 1 or 2 ins. deep where the blades had come in contact with the plates.

Such is the complete story of the accident, as far as we have been able to learn it. The statement made in some of the daily papers that the vessel was in danger of foundering, which was only prevented by the cement packing between the plates, is wholly erroneous. The narrow space between the plates, closed completely as it was by the channel bar to which the plates were riveted, had no connection with the main body of the hull. Even if there had been such a passage—and a leak through it could not have been stopped—



PASSENGER LOCOMOTIVE; FITCHBURG R. R. Schenectady Locomotive Works, Builders.

Weight in working order—	
On driving wheels	78,000 lbs.
" truck wheels	46,400 "
Engine, total	124,400 "
Tender, "	78,633 "
Engine and tender, loaded	203,033 "
Tender, empty	37,300 "
Of full coal capacity	14,000 "
" " water " of tank	33,333 "
Cylinders	20 × 24 ins.
Distance center to center	6 ft. 5 "
" " " valve face	2½ "
Piston rod, diameter	3¼ "

the extent of the damage would have been to flood the after watertight compartment of the vessel, and possibly to damage that portion of its cargo therein contained. As it was, there was no leak of any importance, and no damage was done to any of the cargo. The cause of the accident is at this writing a total mystery. One theory given to explain it is that the bronze propeller and the steel plating and the rivets directly opposite the propeller form a galvanic couple, the galvanic circuit being completed by the brackets which support the propeller bearing. The corrosion induced by the galvanic current would attack chiefly the countersunk heads of the steel rivets and the metal of the plates in the countersunk rivet holes. This action would in time loosen the rivets, and the beating action of the water upon the plates, caused by the propeller blades, which at the nearest point come within about a foot of the sheathing, would start the plates, and might cause them to bulge outward. One fact discovered on inspection of the plates gives currency to this idea—viz., the countersunk holes in the plates do appear to be somewhat corroded. It also appears that the rivets originally had no great hold upon the plates, for the countersinks are in many cases rather shallow. The tops of the rivets were perfectly flush with the plates, as is usual in the sheathing of vessels, and this diminishes the hold of the rivets, as compared with the headed over-rivet used in boilers.

Another theory is that a piece of water-logged wreckage got caught between the rotating propeller blade and the sheathing, and tore the plates. Whether either one of these theories is the proper one must be left for official investigation to determine. It is to be observed that the blades of the twin screws when above their shafts rotate toward each other. In other twin-screw steamers the rotation is in the opposite direction. Whether this direction of rotation had anything to do with the accident may also be left for the official investigation, which no doubt will be instituted when the steamer returns to Havre.

THE AMERICAN LINE STEAMER "ST. LOUIS."

The most important and interesting ship ever built in this country for the commercial marine is the new transatlantic steamer "St. Louis," of the American Line, and it will attract special interest from the fact that it (together with its sister ship the "St. Paul") will run in connection with some of the finest English-built steamers of the same line and in competition with English-built steamers of other lines. The vessel and its engines were designed and built by the Wm. Cramp & Sons' Ship & Engine Building Co., of Philadelphia, Pa., for the International Navigation Co., of Philadelphia, Pa., which operates what was formerly the Inman Line, but is now known as the American Line, with steamers running between New York and Southampton (formerly to Liverpool). The design and construction were executed under the supervision of and in consultation with Mr. James S. Doran, Superintending Engineer of the navigation company, and we are indebted to Mr. Rodman E. Griscom, Second Assistant Superintending Engineer of that company, for photographs and blueprints from which our illustrations have been prepared.

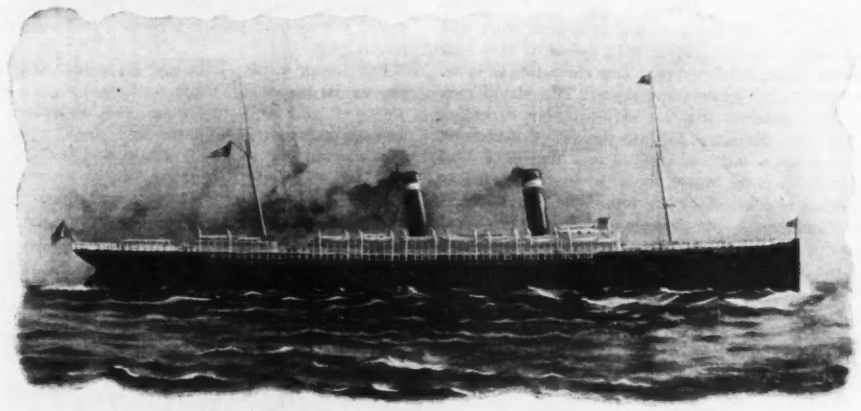


FIG. 1. TRANSATLANTIC STEAMER "ST. LOUIS," AMERICAN LINE.

Wm. Cramp & Sons Ship & Engine Building Co., Builders.

The first frames were erected on July 23, 1893, the hull was launched Nov. 12, 1894, and the ship started on its first trial trip on May 25, 1895. As shown by the view, Fig. 1, the general appearance is very similar to that of other large ocean steamers, but the "St. Louis" differs from the "New York" and "Paris" of the same line in having the more common vertical steamer stem, instead of the graceful, curved clipper bow which distinguishes the latter at once, and if itself crushed in leads to a partial flooding of the ship's hull, while with the curved bow a considerable portion of the force of the collision is absorbed by the projecting part of the bow and the upper part of the hull. An objection, of course, is the extra length of dock room required. This point was discussed in the article on the loss of the "Elbe," of the North German Lloyd Line, in our issue of Feb. 7, 1895.

The hull has a keel 4 ft. 9 ins. deep, from which rise the side frames, consisting of channel irons $\frac{1}{2} \times 3\frac{1}{2} \times 7$ ins. spaced 32 ft. c. to c., while every third frame is of plate or web construction, 30 ins. deep, with longitudinal face plates 30 ins. wide. The bottom is double, with a space 4 ft. 6 ins. high between the inner and outer bottom, and the bottom framing is of angle irons and plates. The keel slopes sharply upward to the stern post, as shown in the longitudinal section, Fig. 2, bringing the foot of the rudder post to about the same level as the propeller bosses, thus cutting away much of the deadwood. In some of the latest English steamers the same object has been attained by arching this part of the keel, the deadwood being thus cut away, while at the same time the rudder post is carried down practically to the level of the keel. The skin plating is mainly of $\frac{3}{4}$-in. steel plate, with lap-butt joints, the vertical seams being triple riveted and the horizontal seams double riveted. In the lap-butt joints the meeting edges of adjacent plates are bent slightly inward and outward, respectively, so as to overlap while keeping the plates themselves in line, and also maintaining the full thickness of the plates. The riveting is through these lapped edges. The frames and plating at the stern are swelled out to enclose the propeller shafts, forming two almost horizontal fins, so that there are no outboard sections of the shafts and no stern shaft brackets. This form of construction is shown in Fig. 3. The skin plating is carried up to the promenade deck forward and aft, forming a forecastle and poop longer than those of the "New York." In the intermediate part the promenade deck is carried by the side frames and by stanchions, and this deck has a steel plate bulwark instead of the usual rail and netting. The weight of the hull is about 6,000 gross tons.

There are five decks—namely, lower, main, upper, saloon and promenade decks; and above these is a shade or boat deck extending the full width of the ship, so as to cover in a part of the promenade deck. Upon this boat deck are all the boats, and above it is the superstructure containing the officers' quarters and the chart house, while above this again are the bridge and the wheelhouse. The height between the decks is from 7 ft. 2 ins. to 9 ft. The interior of the hull is divided into 17 main watertight compartments formed by 12 transverse bulkheads, a longitudinal bulkhead between the two engine rooms, and several flats, or horizontal bulkheads, to suit the interior arrangement of the hull. All the doors in the bulkheads are on the upper deck, above the load-water line, except that there are doors in the longitudinal bulkhead between the engine rooms. Special attention has ben given to the bracing of the bulkheads and their connections with the sides of the hull. The collision bulkhead is 33 ft.

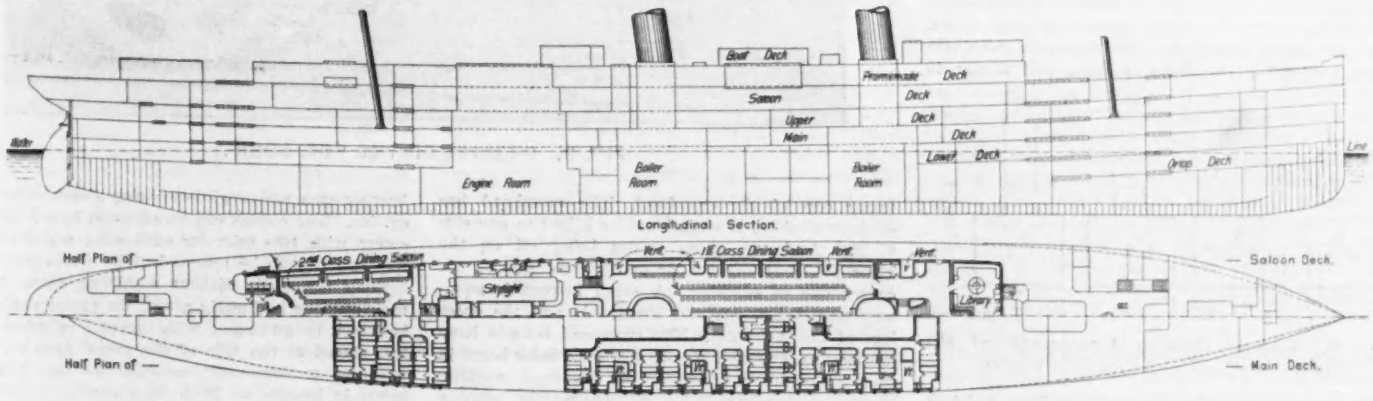


FIG. 2. LONGITUDINAL SECTION AND PLANS OF THE "ST. LOUIS."

behind the stem post. The machinery occupies about 230 ft. of the length of the vessel, and the engine rooms, which are about 50 ft. long, extend the full height. The boiler rooms, however, which are about 40 ft. long, do not extend above the upper deck. The saloon passengers' cabins are all situated within a length of 180 ft. amidships, on the main, upper, saloon and promenade decks, and are in three separate watertight compartments. The

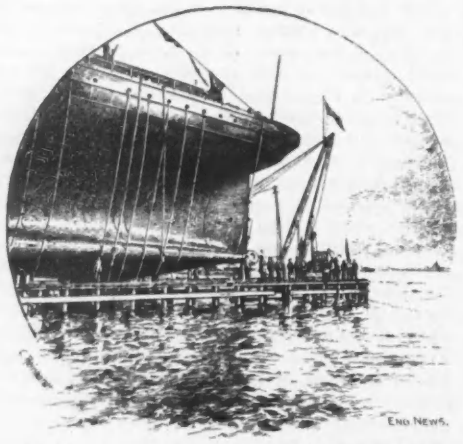


Fig. 3. View Showing One of the Stern Tubes.

cabins of the second-class passengers are in the watertight compartment directly abaft the machinery space, on the main and upper decks, and the steerage quarters are forward and aft of the first and second cabin accommodation, while the quarters for the crew and engine room staff are in the ends of the ship. The promenade deck is continuous from stem to stern and is 12 ft. wide on each side of the deck house. The first-class dining room is 110 ft. long and 50 ft. wide, and can accommodate the full number of 350 passengers at one time. Above it is an arched roof extending above the promenade deck and fitted with decorative white glass panels, instead of the colored glass used on the "New York."

The twin screws are driven by two quadruple expansion engines of the usual vertical, inverted cylinder, direct-acting marine type, and developing 20,000 I. HP. Each of these engines has six cylinders and four cranks, the arrangement of the cylinders being as shown by Fig. 4, which arrangement has been patented by the Cramp company. The high-pressure cylinders are placed above the low-pressure cylinders, being supported on frames or saddles 24 ins. high, which enables a manhole to be placed in the cover of the low-pressure cylinder, thus facilitating inspection and repairs. Steam is admitted simultaneously into the two 28½-in. high-pressure cylinders, is exhausted from them to the single 55-in. first intermediate cylinder, goes thence to the single 77-in. second intermediate cylinder, and finally to

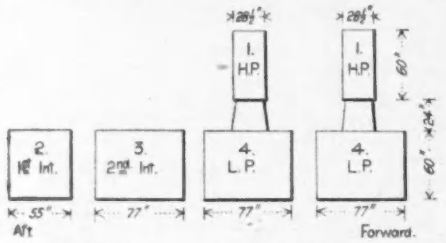


Fig. 4. Diagram Showing Arrangement of the Six-Cylinder Quadruple Expansion Engines.

the two 77-in. low-pressure cylinders, from which it passes to the condensers. The stroke is 5 ft. The cylinders are all cast separately and (except the high-pressure cylinders) rest upon cast iron A frames, these frames being cast in two parts of channel section, with outside flanges for bolting together, so that the castings can be thoroughly inspected. The bed-plate is formed of box castings bolted together in sections, with cross-pieces carrying the bearings. The depth of the bed-plate is 3 ft. 4 ins., increased to 4 ft. 7 ins. at the middle of the transverse portions by swelling the bottom downward, so as to get extra stiffness under the bearings. Longitudinal box girder castings connect the upper ends of the A frames between the cylinders and also extend from the forward and aft A frames to the bulkheads forming the end walls of the engine rooms, these bulkheads being strengthened by plate girders 2 ft. deep. The engines as erected in the shops are shown in Fig. 5, but the high-pressure cylinders are not in place.

Steam jackets are fitted to the second intermediate and the two low-pressure cylinders only, and all the cylinders are lagged with asbestos and hair felt, with sheet steel covers. The clearance is ⅛ in. above and ⅝ in. below the pistons. The piston rods are 6 ins. diameter for the high-pressure cylinders and 8½ ins. diameter for all the other cylinders. The connecting rods are 11 ft. 3 ins. long c. to c. of pins, and the body tapers from 10 ins. diameter at the bottom to 8½ ins. at the top. The upper end is of T shape, with the flanges extending fore and aft, each flange having a hole through which passes the threaded leg of a forged T piece, bolted to the lower cap of the crosshead. These pieces are secured by nuts under the rod flanges and by bolts to the

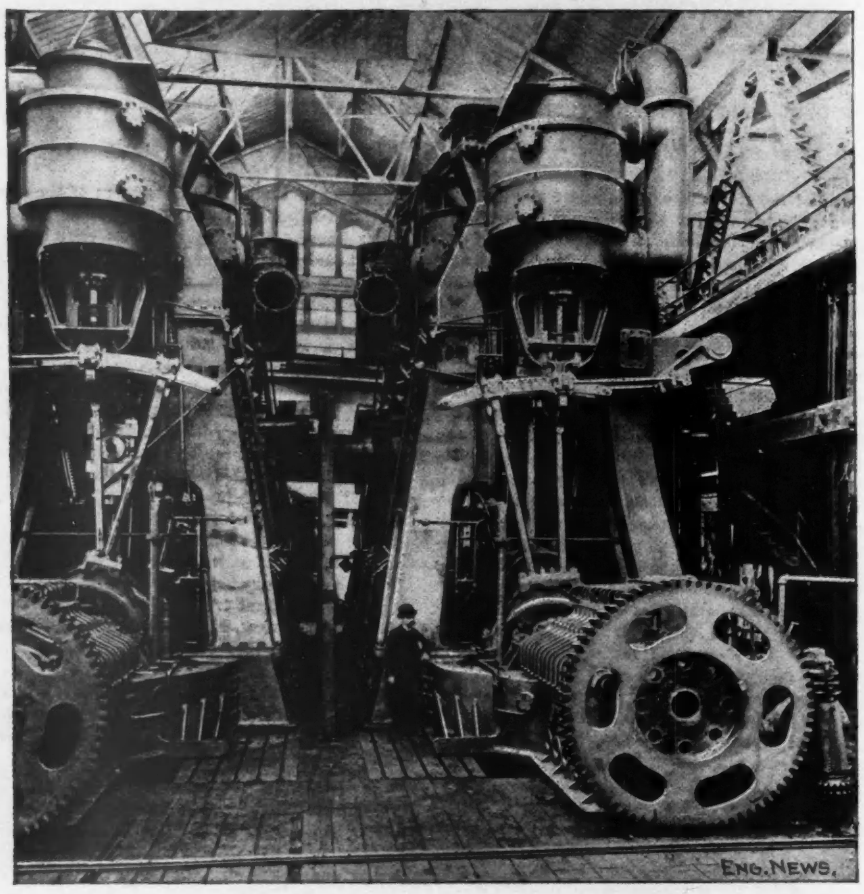


FIG. 5. ENGINES OF THE "ST. LOUIS."

upper cap of the crosshead. The crosshead has slippers working in slipper guides bolted to one side of the A frame, these guides being all on the inner leg of the frame, or on the keel side of the center line of shafting. A small inspection gangway passes between the crossheads and the outer legs of the A frames. The crosshead brasses have the usual adjustment pieces, and have holes bored in them to reduce the weight. All the main working parts are lubricated by oil flowing by gravity through pipes from a supply tank under the engine-room skylight, the delivery at each point being regulated by a needle valve lubricator.

All the cylinders have Thom's balanced piston valves, operated by the ordinary link motion with two eccentrics, the bent rod (or the one on the eccentric which is not directly under the link) being for the reverse or astern motion. The eccentric straps are of cast steel, lined with Parsons' white metal. The valve stem of each high-pressure cylinder is worked by a bell crank lever from the cross-head of the low-pressure valve stem, and each of the low-pressure cylinders has two valves. The starting and reversing gear is operated by a steam cylinder 24×30 ins., cushioned by the adjustment of the valve and by a spiral spring on the guide spindles. The steam pipes are of lap-welded steel, with double-riveted flanges, and the main steam pipes are 20 ins. diameter. The main stop valve is at the level of the high-pressure cylinders, and the admission to these cylinders is controlled by a balanced double-beat piston throttle valve on the main steam pipe.

The crank shaft is 21 ins. diameter, with crank cheeks 16 ins. wide, fitted with crank pins 22 ins. diameter and 31½ ins. long, and there is a 6-in. hole through each crank pin and cheek. The bearings are 26 ins. long, of cast steel lined with Parsons' white metal, and the caps are held down by 4½-in. bolts. Water is circulated through the base of the bearings. The thrust shaft is solid, 14 ft. long, 21 ins. diameter in the body and 33 ins. over the thrust rings, and the thrust bearing is carried by an extension of the engine bedplate. The thrust bearing has 13 horseshoe collars 2½ ins. thick, the bearing area with engines working ahead being 6,616 sq. ins. The collars can be adjusted by a horizontal screw with two nuts for each side, which enables any one ring to be renewed. The worm wheel for turning the shaft without admitting steam to the main engines is directly aft of the thrust shaft, and is driven by an engine with inverted cylinders 8×8 ins. placed at the side of the thrust bearing. The propeller or line shaft is solid, 19 ins. diameter, made in lengths of 28 ft. and carried in bearings 14 ft. c. to c., these bearings being of cast steel 24 ins. long and lined with Parsons' white metal. On the after length of this shaft is a portable coupling to permit of the shaft being drawn for repair, this coupling being in halves bolted together, each half having a longitudinal feather 5 ins. wide and 2¾ ins. high, and collars 1 in. high engaging with grooves on the shaft. The stern shaft is 21 ins. diameter, covered with a 1½-in. liner working in bearings formed by lignum vitae strips 3½ ins. wide and 1 in. thick, allowing water to circulate in the

divisions between the strips. The stern gland is fitted with Tupper's machine-plaited flax packing. The two propellers have steel bosses with three bolted blades of Parsons' bronze, set at a pitch of 27 ft. 6 ins.

Steam is supplied by ten boilers of the Scotch or marine type, one of which is shown in Fig. 6, six being double-end boilers with four furnace flues at each end, and four being single-end boilers, also with four furnaces, making 64 furnaces in all. The boilers are 15 ft. 7½ ins.

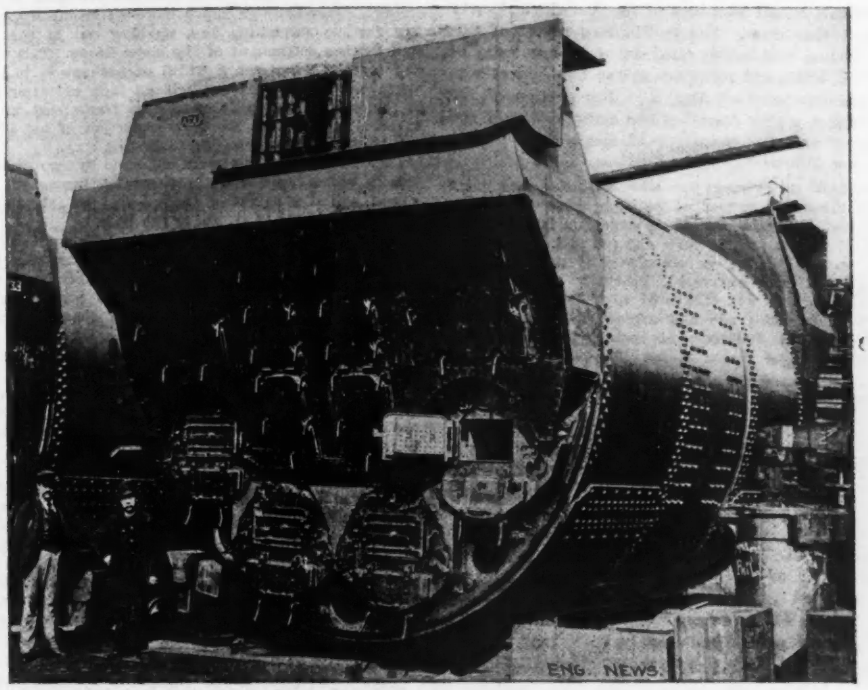


FIG. 6. ONE OF THE BOILERS OF THE "ST. LOUIS."

diameter, the length being 20 ft. for the double-end boilers and 10 ft. 4½ ins. for the single-end boilers. The shell plates are 1 9-16 ins. thick, having all seams quadruple riveted with 1½-in. rivets and the end plates are flanged inwards. The tube plates are ⅝ in. thick. The furnaces are Fox corrugated steel flues, 19-32-in. thick, 3 ft. 3 ins. diameter at the front and slightly smaller at the back to facilitate removal through the boiler head for repairs or renewals, and each has a separate combustion chamber. The furnaces are 6 ft. 10½ ins. long, with ordinary grate bars. There are 832 tubes in each double-end boiler and 416 in each single-end boiler, 328 of the former being stay tubes 2¾ ins. diameter and ¼ in. thick, while the fire tubes are 2¾ ins. diameter and No. 11 B. W. G. There are 6,656 tubes in all, 7 ft. long between tube plates, and the fire tubes are fitted with spiral webs or retarders which cause the hot gases to pass in a spiral course through the tubes, and thus ensure a prolonged contact with the heating surface. The combustion chamber stays are 1¾ ins. diameter for outside row and 1⅜ ins. for the inside row, at a pitch of 7 ins. The total grate area is 1,144 sq. ft., and the total heating surface 40,320 sq. ft. The working boiler pressure is 200 lbs. per sq. in. and there are six 4-in. safety valves on each double-end and four on each single-end boiler. The pressure for the auxiliary engines is reduced by means of reducing valves, and steam for the deck machinery (including windlasses and cargo hoists) is supplied by a donkey boiler. The boilers are arranged in two batteries, each battery consisting of three double-end and two single-end boilers placed in a watertight compartment, the two boiler rooms being 40 ft. apart. The Howden hot-air forced-draft system is used, the air being drawn from the top of the stokeholds by eight 80-in. Sturtevant fans (two for each stokehold) driven by engines with two cylinders 8×8 ins. These fans deliver the air in the heating tubes in the uptake (shown in Fig. 5), where it passes to the chambers in the furnace doors, and thence through perforated plates into the furnace. The stokeholds are open and well ventilated, a longitudinal screen extending from the top to within about 10 ft. of the floor dividing each so as to bring the air current as near the floor as possible, the down-air shaft being on one side, and the other side being closed in on top except for the fan intake. There are two smokestacks, one for each boiler battery, and these are of oval section 11 ft. 6 ins.×14 ft., with their tops about 100 ft. above the level of the grates. The coal bunkers have a capacity of 2,500 tons, or sufficient for eight days' normal steaming at a consumption of 300 tons per day.

The feed-water is heated to 210° F. in Worthington feed-water heaters, and pumped to the boilers by Worthington vertical feed pumps. The condensers and air pumps are separate from the engines, being placed at the sides of the ship, and the total area of the condensing surface is 26,170 sq. ft. The condensers are 7 ft. 2 ins. diameter inside, with six stay rods and ¾-in. seamless brass tubes 16 ft. 8⅜ ins. long, supported at two intermediate points. Each condenser has four Worthington air-pumps with steam cylinders 26 ins. diameter and 20 ins. stroke, and 8-in. valves in the buckets, and these pumps discharge into the hot well tank for the feed-water, this well also receiving the drainage of the traps of the cylinder jackets and the auxiliary engines. The Worthington centrifugal circulating pumps for the condensers have cylinders 12×14 ins., driving 42-in. fans, with 6½-in. inlets and 3¾-in. discharge pipes. The discharge pipe leads to a tank on the boat deck, supplying water at 115° for the baths, kitchens, etc. There is also a cold salt-water tank on this deck. A separate condenser takes the exhaust from the auxiliary engines. The Quiggan system of evaporating and distilling plant is used, and the numerous pumps for boiler feed, condensers, bilge drainage, baths, water supply for cabins, etc., are of the Worthington make.

The auxiliary machinery includes no less than 49 separate engines for the working of the ship, exclusive of twelve engines for the electric lighting and refrigerating plants. The electric lighting plant, supplied by the Electro-Dynamic Co., of Philadelphia, Pa., consists of four four-pole dynamos with compound-wound Gramme ring armatures, driven direct by high-speed engines having cylinders 12×10 ins., with piston valves. Any dynamo can be used for any one of the circuits. Each dynamo develops 360 amperes and 112 volts when running at 470 revolutions per minute, and can supply 700 lights of 16 c. p. There are 1,350 incandescent lamps, and for use at the cargo hatches groups of six lights are used, fitted in a bell-mouth reflector. The wiring is on the two-wire system throughout. There are two Kilbourn refrigerating plants, one forward for dead meat and perishable freight, and the other amidships for ships' stores, this latter having an electric elevator. For these plants there are three two-pole Gramme ring electric motors, series wound to admit of considerable variations in speed, two being of 10 HP. and one of 5 HP. Another motor supplies the air for the organ in the music room. Several shunt-wound motors of 5 to 10 HP. are used for driving the Sturtevant fans for ventilating purposes, these fans being generally 5 ft. diameter and running at 470 revolutions per minute. The ventilation of the compartments containing the cabins is provided for by four sets of two fans each; one fan supplying air through pipes opening into the corridors and passages, whence it enters through ventilators in the cabin doors, and the other draws out the air from the interior of the cabins. The inside cabins are said to be exceptionally well ventilated, but though the air supply may be heated in winter by passing it over a steam radiator, there is no provision for cooling the air in summer, although such provision has been made in other ships and is specially desirable in view of the closeness and oppressiveness usually experienced in the lower and inner cabins of ocean steamers during the summer.

The six cargo hatches have five Williamson steam hoisting engines with horizontal cylinders 8×10 ins., and a 24-in. drum, and there is also a boat hoist mounted on the boat deck. On the forecastle is a Hyde windlass, and there are on the poop and forecastle seven steam capstans, the windlass and capstans being driven by engines having vertical cylinders 12×10 ins., with side valves. These were all supplied by the Bath Iron Works, of Bath, Me. The seven stockless anchors weigh from 1,120 to 1,680 lbs., and the heads of the main anchors are housed in the hawse-holes instead of upon the forecastle deck. The anchor chains have links of 2¾-in. iron. There are 14 ordinary ships' lifeboats, 4 metal lifeboats, 2 small boats, and 14 rafts and Chambers collapsible boats. All these are stowed on the boat deck.

The steering gear, fitted by Williamson & Co., of Philadelphia, Pa., is operated by an 8-in. horizontal screw, 10 ft. long with right and left hand threads, and having two nuts from which connecting rods lead to the ends of the rudder crosshead. The screw is driven by a high-speed engine with two cylinders 14×12 ins., with piston valves operated by Brown's hydraulic telemotor or by shafting from the deck above by bell crank levers. Buffer springs arrest the motion when the helm is put hard over, and assist to bring the rudder back when released. In case of failure of the steering engine it can be thrown out of gear and the steering screw operated by gearing worked by hand-steering wheels, while in case of failure of the screw or other part a tiller on the rudder head can be operated by the steam or hand steering gear through the intervention of wire ropes. A friction strap on a horizontal pulley on the rudder head holds the rudder steady while any change is being made in the gear. A pointer moving over a contact plate operates an electric indicator on the bridge showing the position of the rudder. An electric indicator in the engine-room shows the speed of the shaft, the current varying with the speed, and there is electric communication between the dials of the "tell-tale," on the bridge and in the engine-room.

There is accommodation for 350 first-class passengers, 200 second-class, and 800 third-class or steerage, while the officers, mechanical staff and crew will aggregate about 400, making in all 1,750 persons on board. The cargo holds have capacity for about 1,820 tons of freight. Provision is made for fitting light navy rifled guns, so that the ship can be converted into a "commerce destroyer" or cruiser. In order to obtain the mail subsidy from the United States government the "St. Louis" must attain a sea speed of 20 knots on a four-hour trial. On the first voyage from New York to Southampton the engines were not run for any very high speeds, but the average speed was 18.3 knots, and the maximum speed 19½ knots with the engines developing

16,000 HP. and making 85 revolutions per minute. The daily runs were 314, 443, 379, 441, 433, 432, 416 and 269 miles, aggregating 3,127 miles from Sandy Hook. The "New York" made a record trip from Southampton in September, 1894, the time being 6 dys. 7 hrs. 14 mins., and the average speed being 20.17 knots for a distance of 3,047 miles. The sister ship "Paris" has shown a better speed performance than the "New York," its maximum speed being 20¾ knots per hour. The fastest trip across the Atlantic was made in 5 dys. 14 hrs. 24 mins., the distance run on this trip being 2,782 miles, and the speed averaging 20¾ knots, which was the highest record until the Cunard steamers "Campania" and "Lucania" came out. The "Campania," of the Cunard Line, made a record run from Queenstown in August, 1894, in 5 dys. 9 hrs. 29 mins., with an average speed of 21.5 knots for a distance of 2,776 miles. Last, but not least, the Cunard steamer "Lucania" made the fastest transatlantic voyage on record in October, 1894, the time from Queenstown to Sandy Hook being 5 dys. 7 hrs. 28 mins., or an average of 21.81 knots for a distance of 2,779 miles. The longest daily run ever recorded by the "Lucania" was 560 miles. The leading dimensions of the largest and fastest transatlantic steamers now in service are given in the following table, and the "Campania" was very fully described in our issue of Nov. 30, 1893:

Dimensions of Fast Atlantic Steamers.

	American.		White Star.	Cunard.
	"St. Louis" and "St. Paul."	"New York" and "Paris."	"Majestic" and "Teutonic."	"Campania" and "Lucania."
Length over all	554 ft. 2 ins.	563 ft. 0 ins.	582 ft. 0 ins.	622 ft. 0 ins.
Length between perpendiculars	535 " 8 "	525 " 3 "	565 " 0 "	600 " 0 "
Beam	63 " 0 "	63 " 4 "	57 " 0 "	65 " 3 "
Beam to length	1 to 8.492	1 to 8.373	1 to 9.826	1 to 9.231
Depth of hull	42 ft.	42 ft.	39 ft.	43 ft.
Draft	26 "	26 "	.....	.....
Displacement, tons	16,000	.....	.....	.....
Tonnage	11,629	10,000	9,965	13,000
Speed, maximum, knots	.....	20.75	.....	23.18
Engines, I. HP.	20,000	18,500	17,500	31,000
"	2 quad. exp.	2 trip. exp.	2 trip. exp.	2 trip. exp.
Cylinders, No.	6	3	3	3
" diameter, ins.	28½, 55, 77	45, 71, 113	43, 68, 110	37, 79, 98
" stroke, ft.	5	5	.....	6
Boiler pressure, lbs. per sq. in.	200	150	180	165
No. of boilers	10	9	16	12
" " furnaces	64	54	76	96
Tons coal carried	2,500	2,500	2,400	2,900
Coal consumed per day	300	300	300	.....
No. of passengers, first class	350	400	300	600
" " " second class	200	200	200	400
" " " third class	800	400	1,000	1,000
Officers and crew	400	400	360	415
Tons of freight	1,000	1,000	3,500	1,620
Date of fastest trip	July, '95	Aug., '94	Aug., '94	Oct., '94.
Time " " "	6d. 18h. 47m.	5d. 14h. 24m.	5d. 16h. 31m.	5d. 7h. 28m.
Length of " " miles.	3,121	2,814	2,778	2,779
Speed " " " average of trip, knots.	19.2	20.75	20.34	21.81

It is of interest to note in connection with the large new steamers "St. Louis" and "St. Paul" that all of the steamers of the once famous Collins Line, running between New York and Liverpool, and those of the Vanderbilt Line, running between New York, Southampton and Havre (both of which lines are long since defunct), were built in this country. Since the days of these old lines, which ended before the war, the construction of seagoing steamers in this country has been mainly confined to vessels for the Pacific, South Atlantic and coasting service, but in 1872 the four steamers "Ohio," "Pennsylvania," "Indiana" and "Illinois" were built by the Wm. Cramp Co. for the transatlantic service of the American Line, running between Philadelphia and Liverpool.

REPORT ON DEFECTS IN THE QUEEN LANE RESERVOIR, PHILADELPHIA.

After paying $1,160,000 for the Queen Lane water-works reservoir, with further sums still due the contractor, but retained on the ground of defective work, the city of Philadelphia finds that it must expend some $250,000 in repairs before the structure will hold water. The reservoir was practically completed on Oct. 1, 1894. At the request of Mayor Stuart, Messrs. John A. Wilson, M. Am. Soc. C. E.; A. Fteldpauche and J. J. de Kinder, M. Am. Soc. M. E., examined the reservoir in November, 1894. A brief abstract of their report was given in Engineering News of Dec. 13, 1894. In general, they exonerated the contractors, against whom allegations of defective work had been made. Later the reservoir was filled to the depth of 10 ft. and developed leaks at five points, the leakage aggregating nearly 1,000,000 gallons a day. The leak nearest the reservoir, according to the report mentioned below, was about 123 ft. from the foot of the inner slope, and 9 ins. above the level of the reservoir bottom. With 2 ft. of water in the reservoir, flow took place from only one leak, this being 330 ft. from the foot of the inner slope and 13 ft. lower than the bottom of the reservoir.

Another commission of experts was appointed to examine the reservoir, consisting of Messrs. John C. Trautwine, Jr., Chief of the Philadelphia Bureau of Water; Rudolph Hering and Maj. C. W. Raymond, U.S.A., all Members of the American Society of Civil Engineers. The preliminary report of this commission was briefly abstracted in our issue of June 27, 1895, and reference to the final report was made in our issue of Aug. 8. The portion of the final report which describes the construction of the reservoir and the character of the leaks we condense as follows:

The rock underlying the site is gneiss and mica schist, the upper portion of which is more or less disintegrated. Nearly continuous over this is a layer of sandy clay, and on this rests the top soil.

The material on the space enclosed by the site of the embankment was excavated, generally to sub-grade When in rock it was excavated to a depth of several inches below sub-grade and afterward leveled up to sub-grade with disintegrated rock, which was then compacted by a steam roller. The few projections left above sub-grade were removed by pick or by blasting.

The total length of the foot of the inner slopes in both basins is 7,210 ft. Of this about 6,200 ft. are in excavation below the natural surface. On this portion, therefore, the base of the artificial embankment is higher than the floor of the reservoir. On the other portion the level of the floor was brought up with material of the same character as the best used in the banks, and this was rolled in layers continuously with those in the banks.

The sandy clay found in place was broken up and rolled. It extends, as a rule, across the width of the bank. Its thickness varies, in general, from 18 to 30 ins.

The main body of the banks is built chiefly of the disintegrated micaceous rock. The core wall was formed of clay taken principally from the site. For that portion of the banks between the core wall and the inner slope, material containing but few large stones was selected.

The inner slopes and the bottom are covered with a layer, 2 ft. thick, of clay, brought chiefly from a field south of the reservoir.

On the slopes the clay is covered with concrete slabs, 10 ft. wide, and diminishing in thickness from 12 ins. at foot to 6 ins. at top. On the bottom it is covered with 4 ins. of concrete, which overlaps the foot of the slope lining.

From Mr. Ely's report it appears that the materials were well selected and the work properly done in accordance with the instructions of the department. (Mr. Amasa Ely was the inspecting engineer in charge of the work.—Ed.)

The disintegrated micaceous rock of which the banks are composed is apparently as well compacted as its nature would permit. A settlement of probably less than 1 in. appears to have taken place in the division bank, and a crack about ¼ in. wide has opened between the northern end of the eastern pass-pipe and the concrete slope lining above it.

The slabs forming the inner slope lining do not appear to have settled vertically as a whole, or to have slid in the direction of their lengths. Their edges, adjoining the stops at the stop houses, are badly cracked.

We find no other indication of unequal settlement in the banks.

Soon after the admission of water it undoubtedly began to pass through the joints between the slope and bottom linings, between the slabs forming the lining of the slopes, and possibly also through the body of the concrete, saturating and softening the clay lining and washing out some of it, thus permitting the lower parts of the slabs forming the slope lining to settle into the clay, leaving between them and the overlying bottom lining a space through which more water entered, causing further saturation and washing out of the clay and further settlement of the slope lining. This opening reached in places a width of perhaps ½ in., and when there was scarcely half an inch of water over it the water escaped through it so freely that we are satisfied that by far the greater portion, if not all, of the observed leakage occurred in this way.

This deformation is clearly indicated by two series of cracks which appear quite generally throughout the slopes, one at a height of about 5 ft., and the other at a height of 10 or 12 ft. above the floor.

Except as indicating this feature, these cracks are of but little importance, as are also numerous other horizontal cracks, mostly very narrow, in other portions of the slabs, for the concrete lining is provided as a protection to the clay lining, rather than for watertightness.

In some of these places the concrete floor lining also has settled, and has cracked at a distance of a few feet from the foot of the slope. Since the emptying of the reservoir this floor lining, owing, no doubt, to the action of the sun's rays, has in some places warped considerably along these cracks.

Cracks have appeared in the floor along the seams formed between the portions laid on successive days, and the concrete adjoining some of them is quite disintegrated, and can easily be removed by the hand.

With these exceptions the concrete, so far as examined, is of good quality.

In each basin we find depressions, two of which are from 1 to 2 ins. deep and from 50 to 100 ft. in circumference. A slight crack can be traced around one of these in the south basin. These deformations may be attributed to inequalities in the filling under the clay lining, or to imperfect compacting of the latter.

The clay lining, which was intended to assure the imperviousness of the reservoir, has, wherever examined, been found of full thickness and well compacted. The clay contains a considerable proportion of mica, and, upon a casual examination, appears to be scarcely a suitable material, by itself, for the formation of a watertight lining. Nevertheless, when properly confined, it has considerable power of self-puddling, as shown by our examinations, and particularly by the experiments of Mr. Hand, the General Superintendent. That it is not sufficiently impervious is evident from the fact that the water which escaped through the opening between the slope and the floor linings made its way to the exterior of the reservoir.

In many places small quantities of clay had washed into the basin through the seams and cracks on the slope and on the floor.

The core wall evidently adds but little to the watertightness of the reservoir. It is formed of material of doubtful quality, and its base is in general higher than the floor of the basin.

The outer slopes of the embankments are very steep, in some places nearly 1 to 1. The experts recommend that these be increased to 2 to 1. To make the reservoir watertight, two methods are proposed: (1) To reconstruct either the core wall or the interior lining; (2) to place an impervious coating over the present lining. The latter course is recommended with asphalt for the coating. The advantages of this material are stated as follows in the report:

Asphalt, properly prepared and applied, is impervious to water. Its toughness and flexibility enable it to conform, without rupture, to slight cracks and settlements in the underlying material, thus indicating where repairs may be necessary. Any repairs required in the asphalt itself are easily made.

Reservoirs in various parts of the world have been lined with asphalt, and the resulting experience has been fully recorded. Where properly applied these linings have proved successful, even under trying conditions.

Before applying the asphalt the experts advise that the concrete should be repaired where damaged, and it would be advisable where the clay lining does not extend to rock to put in a footing of Portland cement concrete.

The recommendations regarding the asphalt lining, slightly condensed, are as follows:

For the floor we recommend, from the experience recorded, the use of either natural bitumen from Califor-

nia (Alcatraz) or Venezuela (Bermudez), with an admixture of sand and carbonate of lime, or the rock asphalts from Europe (Neuchatel or Seyssel). In either case the material should be applied in a manner similar to that employed with sheet asphalt for street paving.

For the slopes we think the material should be natural bitumen, with a less proportion of foreign matter than for the floor, and should be spread as a thick paint.

Before the application of the first coat the surface of the slabs should be roughened; as, for instance, by a thin wash of strong Portland cement, upon which, while still fresh, coarse sand or crushed quartz is sprinkled.

As a further precaution against sliding or crawling of the asphalt in hot weather, we recommend that a layer of heavy burlap, suitably anchored in a groove at the top of the slopes, be stretched tight upon the first coat of asphalt and pressed into it. Upon this burlap the second coat of asphalt, made somewhat harder than the first, should be spread.

Similar applications of burlap to the Linda Vista reservoir, in Oakland, Cal., 35 ft. deep, side slopes 1 to 1, and to another California reservoir, with nearly vertical sides, have been perfectly successful in preventing creeping of the asphalt; in the former case, for three years.

The application of the asphalt should be made while the prepared surface of the concrete is thoroughly dry, clean and warm.

If the weather should be such as to render it desirable, the surface should be artificially heated prior to the spreading of the asphalt.

We are satisfied that this lining will prove effective if sufficient care is taken in its preparation and application.

The proper composition of asphalt, the best proportions of sand and pulverized carbonate of lime and the modes of application under different conditions are as yet matters of special expert knowledge. We, therefore, advise that the specifications for this part of the work be prepared by one or more engineers who have given special observation and study to the lining of reservoirs with asphalt, and who have had facilities for forming proper conclusions therefrom.

The inner slopes of the reservoir should be lined with the asphalt coating from top to bottom, but we consider it unnecessary, at the present time, to coat the entire floor with asphalt. Leakage of such a character as to involve danger can hardly occur except near the banks, and any leakage through the rest of the floor will probably cease in time, owing to the tendency of the clay to become more perfectly puddled under the action of any escaping water.

We therefore advise that the asphalt lining on the floor be confined to a strip 50 ft. wide, extending entirely around the foot of the banks of both basins.

After the repairs are made, the floor may be advantageously covered with a thin layer of loose clay. If water is then admitted, and mingled with this clay, and left standing for a sufficient time, we believe that in percolating through any pores in the concrete and clay lining it will increase the impervionsness of the bottom of the reservoir.

To afford facilities for studying the reservoir in the future, the experts recommend that a drain, or ditch, be dug completely around the reservoir.

The estimated cost of the repairs is $232,000, of which $15,000 is for the concrete footing and general repairs to the interior, $70,000 for the asphalt lining on the slopes, $60,000 for that on the floor; $75,000 is for the reinforcement of the outer slopes and $12,000 for the ditch.

SOUNDING BOAT USED ON THE DANUBE RIVER IMPROVEMENT.*

(With Inset.)

As our readers know, work has been in progress for five years past on the improvement of the Danube River in the vicinity of the famous "Iron Gates," where the navigation of this most important river of Central Europe has always been seriously obstructed. The work was described in our issue of April 2, 1892. It involved the removal of a very large area of submerged rock, lying at various depths beneath the surface, and in order to ascertain when the required depth was reached and to make sure that no jagged points projected above the general level to form a menace to vessels, a very great number of soundings had to be taken. In the rapid current of the Danube this promised to be a work of great difficulty, if ordinary sounding methods were pursued, and, in addition, there was risk that errors in determining the location of the sounding boat might result in the failure to find some of the projecting points.

For these reasons a system of sounding has been devised which determines the contour of the river bed with an accuracy which has probably never been equaled in any previous work. This work is being performed by a special sounding boat, which is illustrated on our inset sheet in the current issue, and which covered the excavated area with soundings only 1 m. (39½ ins.) apart in each direction.

The floating structure consists of two hulls, laterally braced and connected by cross beams carrying a platform. Each hull is 35 m. (114 ft. 10 ins.) long, and 4 m. (13 ft. 1½ ins.) wide, and the two are placed 13.35 m. (43 ft. 9⅝ ins) c. to c. The platform, which is built on a level with the decks, is 9.35 m. (30 ft. 8⅛ ins.) wide, and 21.25 m. (69 ft. 8⅝ ins.) long. Upon this platform the holes through which the sounding rods are to pass, are located in lines parallel and perpendicular to the center line of the boat and 1 m. apart. There are 210 holes in all. Between the longitudinal lines of holes are six lines of rails, forming five tracks of 2 m. (6 ft. 6¾ ins.) gage each. The carriage supporting the sounding rods moves up and down on these tracks, and is transferred at the ends from one track to the other by means of a car moving on a depressed transverse platform at each end of the boat. The gage of the track on which this car moves is 1.2 m. (3 ft. 11¼ ins.) wide. In line with each of the two extreme transverse rows of holes are two poles, one on each hull, which are sighted on from the shore in finding the position of the vessel. Two heavy four-armed anchors hold the boat against the current, and two side anchors on each side enable the vessel to be adjusted laterally and held in firm position while the soundings are being taken. The gross weight of the floating structure is 140 tons, and it draws 0.6 m. (23⅝ ins). of water.

The carriage supporting the sounding rods is shown in Fig. 1. It is mounted on a low truck with 2m. (6 ft. 6¾ ins.) wheel-base; each of the four sounding rods is held in a vertical position by two pairs of rollers, which are 2.26 m. (7 ft. .) ins.) apart. The rods are hoisted or lowered by means of a rope attached to the lower end of each rod, and passing around a drum, as shown. The rods are 10 m. (32 ft. 9 11-16 ins.) long and 121 mm. (4¾ ins.) in diameter, being strong enough to resist bending, through the force of the current. There is a vernier attachment, shown just above the drum; the elevation of the platform is taken, and referred to a bench mark, after which the vernier is adjusted. The scale on the rod reads to decimeters, that on the vernier to centimeters; the accuracy of a reading depends, of course, largely upon the steadiness of the boats, which, owing to their shape, their considerable distance apart, and the heavy weight supported, is very satisfactory.

In addition to the equipment mentioned, the boats are provided with suspended drag frames, shown in Fig. 4, which may be adjusted for varying depths of the finished work, and which indicate any obstructions in the river bed that project above the required depth.

* Abstracted from the "Journal of the Society of German Engineers," by O. J. Marstrand, M. Am. Soc. C. E.

The practical value of fireproofing of iron buildings is about to be investigated by a joint committee appointed for that purpose by fire insurance companies, architects, and engineers. The committee consists of Mr. S. A. Reed, representing the Underwriters' Tariff Association of New York; Mr. Geo. L. Heins, of the firm of Heins & Lafarge, the Architectural League of New York; and Messrs. H. de B. Parsons and Thomas F. Rowland, Jr., of the American Society of Mechanical Engineers. It is proposed to carry out experiments on a large scale, and to test the effect of an intense fire on the structural iron and steel shapes now universally employed in large buildings, and the protective effect of the different fireproofing materials.

The Carnegie Steel Co. has offered to give the committee all the iron and steel that may be required, and the Continental Iron Works, has given the ground necessary for the erection of the furnaces on which the committee has already commenced to build the required plant. There will be a gas producer to supply the fuel gas, arranged to receive a spray of petroleum in case higher temperatures may be required than those obtained from the combustion of the gas alone.

Furnaces for testing full-sized columns and floors will be erected. The foundations of these furnaces will consist of side walls with an arch between them, enclosing a safe place for the introduction of the gas pipes and for a hydraulic cylinder. On the top of this foundation will be erected a room built of the materials to be tested. The columns will be loaded by pressure from the hydraulic cylinder, and during the tests a safe load, such as is prescribed by the building laws of this city, will be put upon it. The arches for the floors will be loaded by dead weight. Every precaution will be taken to make the tests uniform as regards temperature, draft, cooling by water streams, etc., so that the results may be comparable.

The committee will be pleased to communicate with any one who may be interested in this matter. Its address is Room 106, 22 William St., New York city.

Bids for the right to use the sewage of Salt Lake City for irrigating purposes, including the use of 75 acres of land owned by the city, are wanted until Aug. 22. Mr. A. F. Doremus is Chairman of the Board of Public Works.

An experimental garbage crematory is being built in New York city, at the expense of Mr. Herbert Tate, a contractor, of 21 East 20th St. It is located on Eleventh Ave., between 52d and 53d Sts. Garbage will be delivered to it by the Street Cleaning Department.

The record in fast rolling in Bessemer steel works has been broken at the Edgar Thomson Works, at Braddock, Pa. On July 30, with two 15-ton converters and 73 heats, the output was 1,110 tons 990 lbs. On the previous night, with 69 heats, the product was 1,040 tons.

A concession for a railway from Puerto Cabello to San Felipe and San Augustine, in Venezuela, 325 miles long, is said to have been granted by the government of Venezuela to a syndicate of American capitalists, including Donald Grant, of Faribault, Minn., and W. H. Fisher, J. A. Bowman, J. P. Elmer and M. E. Clapp, of St. Paul, Minn. It is stated that the grades are easy, only three rivers have to be bridged, and no tunnels will be required. There are about twelve towns of 1,200 to 1,500 inhabitants along the route, and the cost of construction is estimated at about $25,000 per mile, or about $8,000,000 in all.

A plate girder 123 ft. long and 10 ft. deep, weighing 50 tons, was recently shipped to Philadelphia, over the Pennsylvania R. R., by the Shiffler Bridge Co., of Pittsburg, Pa. The ends were supported on the iron frame cars used to carry the Krupp guns to the Columbian Exhibition, the cars being separated by three flat cars as spacers. On July 20 the girder was upset into the ditch near Johnstown, Pa., owing to the train being run at too high a speed, but it is said to have been but little injured. The loading was inspected by an official of the Pennsylvania R. R. before the girder left the bridge yards.

Very low bids for paving with cedar blocks on a concrete foundation were recently received at Detroit, Mich. Bids for three contracts aggregating about $23,000 were made at 97 cts. a sq. yd. This is said to be the lowest bid ever received by the city for such work, the lowest bid last year being $1.04 and two years ago $1.10 a sq. yd.

Test borings for the Clinton dam, which is to form a part of the Metropolitan Water Supply for Greater Boston, are being started at Clinton, Mass., under the direction of Mr. T. F. Richardson, M. Am. Soc. C. E.

The Boston Transit Commission, which is in charge of the construction of the underground railway at Boston, Mass., has moved its office to 20 Beacon St.

The U. S. cruiser "Olympia," now at San Francisco, has been ordered to join the Asiatic squadron, and will try to make an ocean record for speed as far as Honolulu and possibly across the Pacific. The "Olympia" made a fraction under 22 knots per hour on her trial trip, and is expected to average 18½ knots on the 1,200-mile run to Honolulu.

Tests of the boilers and engines of the lake steamers "Northwest" and North Land," belonging to the Northern Steamship Co., are being made by an expert board from the Bureau of Steam Engineering of the Navy. These vessels are equipped with Belleville tubulous boilers and quadruple-expansion engines, and their equipment has been a matter of much interest to the Bureau, which is strongly inclined toward the tubulous boiler as the boiler of the future.

The abolition of several grade-crossings of streets in Lancaster, Pa., is the subject of a pending negotiation between the Pennsylvania R. R. Co. and the city officials. The railroad company proposes that the city shall lay out two streets parallel to the railroad, distant 100 to 200 ft. on each side, and vacate six intersecting streets between these new streets. The company on its part will agree to build an iron bridge over the principal intersecting street, raising the grade sufficiently to allow this to be done.

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Ever since the modern tall office building, with an iron or steel inside structure and an outside veneering of stone, brick and terra-cotta, began to be erected, engineers have been protesting against the use of cast iron columns in such buildings, and predicting that some day a disaster would take place in a tall building which would equal in fatality the failure of the Ashtabula bridge, on Dec. 29, 1876, in which 80 people were killed. In an account of this bridge failure by Mr. Charles McDonald ("Trans. Am. Soc. C. E.," 1876), it is stated that one of the cast iron angle blocks had a lug broken off close to the face, and the line of fracture disclosed an airhole extending over one-half of the entire section. Several chord castings were broken into small fragments, and some of those which were not broken in the body had one or more lugs knocked off.

The predicted failure of a building erected with cast iron columns has taken place in New York city, as described elsewhere in this issue, although the loss of life was not as great as in the Ashtabula bridge disaster, and as in that case airholes hidden inside of castings are at least a contributing cause of the failure. The only excuse for the use of cast iron columns is that they are cheaper—though but very little cheaper—than steel columns. It is high time that the law made the use of such columns in tall buildings impossible. There are other buildings with cast iron columns now in course of erection in New York city, larger and taller than the one which has just failed. Perhaps it is not too late yet for the Building Department to inspect these columns for thickness and for blowholes, or even to compel their removal on the ground of public safety, and the substitution of steel columns for them.

As announced on another page, a committee is now at work on tests of materials for fireproofing structural ironwork, the results of which promise to be of great value to the profession in settling the disputed question as to the protection which fireproofing of various types affords to a modern steel-frame building. The committee is dependent on voluntary contributions to defray the cost of its tests, but the importance of its work is such that architects, engineers and manufacturers should unite to furnish all necessary funds to make the tests extensive and conclusive.

The important bearing which grade crossings of steam and electric railways have upon the safe operation of steam railways has frequently been noted in these columns. An order has recently been issued to the employees of the Maine Central R. R. by Mr. Payson Tucker, General Manager, requiring watchmen at grade crossings of electric railways to display a red ball or lamp on a signal post before allowing any electric car to go on the crossing, this signal being in addition to the gates and flags, and being hoisted for every car, whether a train is expected or not. Furthermore, enginemen must approach such crossings with trains under control, ready to stop before reaching the crossing if the red signal is displayed.

This is the first instance which has come to our notice of the adoption of such measures by a steam railway. That it is a measure to be commended in the interest of safety cannot be doubted; but what is practicable on the Maine Central might not be practicable on the Pennsylvania or the Boston & Albany or any railway running through a state where electric railways are numerous. The requirement that trains shall approach all grade crossings of electric railways under control, and prepared to stop if the signal is at danger, would make necessary such frequent slackening of speed as to make fast time impossible. The railways are right in opposing the creation of such grade crossings by every means in their power.

Those who some years ago expressed their faith in arched masonry dams, notwithstanding the scoffs of some of the critics of this class of structures, will be gratified to learn that the Sweetwater dam, one of the boldest existing structures of this class, passed 22 ins. of water over its parapet last January without other damage than would be incident to any type of dam under flood. An account of the flood, with views of the structure before, during and after its occurrence, is given elsewhere in this issue, together with a plan and cross-section of the dam, showing the erosion below the dam caused by the overflow. The dam was not intended to pass water over its crest, but the flood was so much greater than the maximum assumed when designing the structure that the spillway and blow-off pipes could carry only a small part of the flow. The structure is being altered in accordance with this experience, as described elsewhere.

A great deal has been written during the past decade upon the values of public franchises, and much progress has been made in the development of an intelligent public opinion upon this subject and in the growth of an equitable system of adjustment between the public and the companies which carry on public business. But amid the frequent evidences of progress in this respect occasional instances crop up of old-time disregard of public rights and public property. Such an instance has just occurred at Spokane, Wash., if newspaper reports tell the truth. The council of that municipality has just granted a 50-year franchise to an electric lighting company by a vote in which only one member of the council voted No. This man's name is spelled A-n-g-e-r, and it is to be hoped that his feelings were spelled the same way when he cast his ballot.

One can scarcely imagine a juster cause for righteous indignation than the giving away of valuable rights and privileges which belong to the next generation. That men who are bound by oath to act as trustees of public rights and guardians of public welfare should do such a thing in these days of public enlightenment on this subject makes them all the more culpable.

The franchise granted at Spokane Falls may be in all other respects a model one, but it is doubtful whether a body of men who grant a franchise for so long a term would show any better judgment on other points involved.

Another instance of a long-term franchise which is now pending is in the little Missouri town of Kirkwood, where a system of water-works is desired. Kirkwood had a population of 1,777 at the last census, and has had a rather discouraging time of late in attempting to secure water-works. It is reported that one of the conditions of the 50-year franchise which the town has offered was that for the first five years the company should furnish water free of charge to at least ten hydrants, after which a rental of $50 a year will be paid. This is a reversal of the terms which might be expected, for if ever a company needs a hydrant rental it is during its first years of existence. A 50-year franchise is at least twice too long for any town to grant, and its offer, together with the unusual provision as to hydrant rental, indicates that Kirkwood, as well as Spokane, is greatly in need of advice on the franchise question. Kirkwood is near St. Louis, so near that a supply from the works of that city has been proposed. If it cannot get water from St. Louis it might perhaps secure some advice from some of the able engineers and attorneys of that city that would save it from making a sad mistake in its disposal of the franchise question.

Another act has been performed in the Jersey City water comedy. The Board of Street and Water Commissioners has awarded a contract for a new supply at a price $2,300,000, or 40 per cent. in advance of that offered by the lowest bidder. The only approach to a valid excuse for this action is the fact that the accepted bid excludes that portion of the Rockaway watershed in which the larger villages are located. But the lowest bidder, in submitting a larger drainage area, offered to divert the sewage from these villages by an intercepting sewer. The farcical part of the affair is the other arguments which are advanced by the Commissioners in support of their award, the principal one being that the accepted bid provides for 250 days' storage against 140 in the lowest bid. But the Board's own specifications call for only 100 days storage, and it ignores the fact that the company to which it recommends the award be made offers an inadequate drainage area, comprising only 65 square miles, against 118 square miles offered by the lowest bidder. By dividing the respective bids by the storage offered, the Commissioners are able to declare with triumph that the lowest bid involves $40,357 per million gallons stored, while the highest involves only $31,800. But the city stated in its specifications that it wanted to buy works with a storage capacity for 100 days' supply, at 50,000 gallons a day, or 5,000 million gallons. If we divide this amount into the $5,650,000 asked for the works by the lowest bidder and the $7,950,000 of the accepted bid, the result would be $113 and $159 per million gallons, respectively. Or, if the Board thinks it proper to consider storage beyond what the specifications require, and without regard to whether the drainage area would ever furnish water enough to fill the reservoir and supply 50,000,000 a day meanwhile, it might have divided the respective bids by the corresponding square miles of drainage area, in which case the lowest bid, $5,650,000 ÷ 118 = $48, and the accepted bid, $7,950,000 ÷ 65 = $122 per sq. mile of watershed.

Whether it knows it or not, the board has been juggling with figures with the result that if the public accepts them as intended, it will be deluded.

Fortunately the Board of Finance has already announced that it will put a stop to all this foolishness when the contract comes before it for concurrence. This Board only a few weeks ago nonconcurred in an award by the Street and Water Commissioners to the same company, largely on the ground of an inadequate watershed, which has since been increased, but not sufficiently. It anticipated the latest action of its sister body, and warned it that it could not concur in awarding a bid at a price over $2,000,000 above that of the lowest tender, and in vigorous language insisted that it was folly, as has so often been urged in these columns, to act without the advice of expert engineers.

We have repeatedly commented on the blundering way in which attempts to secure much needed pure water for Jersey City have thus far been carried out, and the results, or lack of results, which might be expected under the circumstances. The failure of the fourth attempt in three years to secure water may prove a blessing, if the past experience

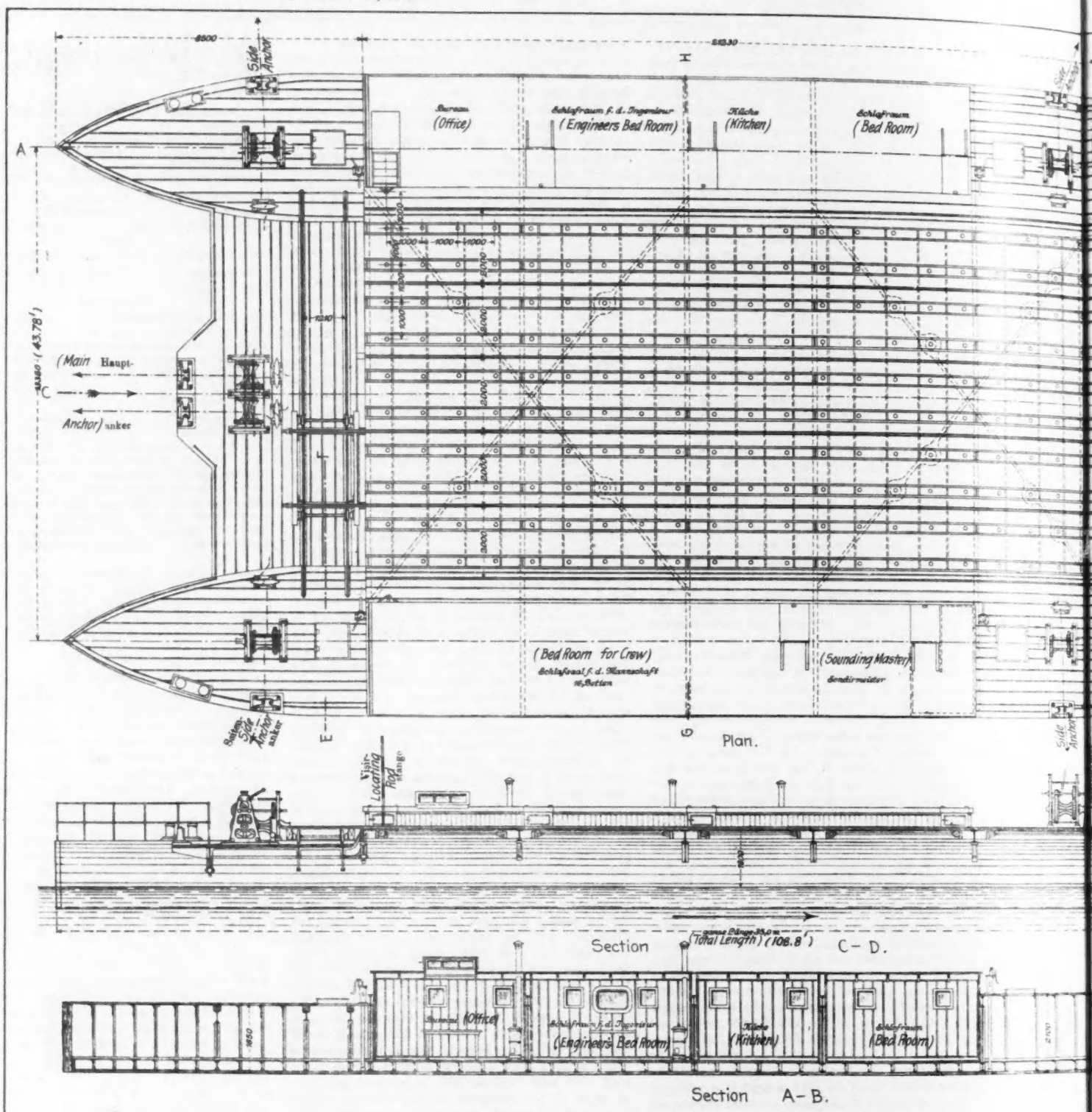
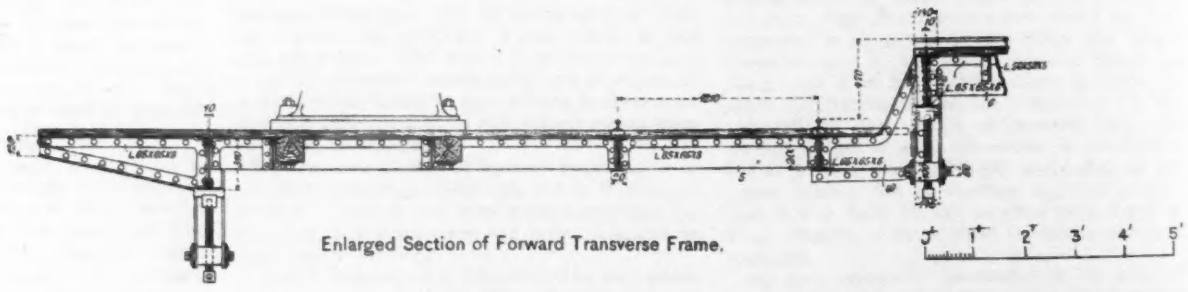


FIG. 2. PLAN AND LONGITUDINAL SECTIONS OF SOUNDING BOAT.



Enlarged Section of Forward Transverse Frame.

SOUNDING BOAT USED ON THE D

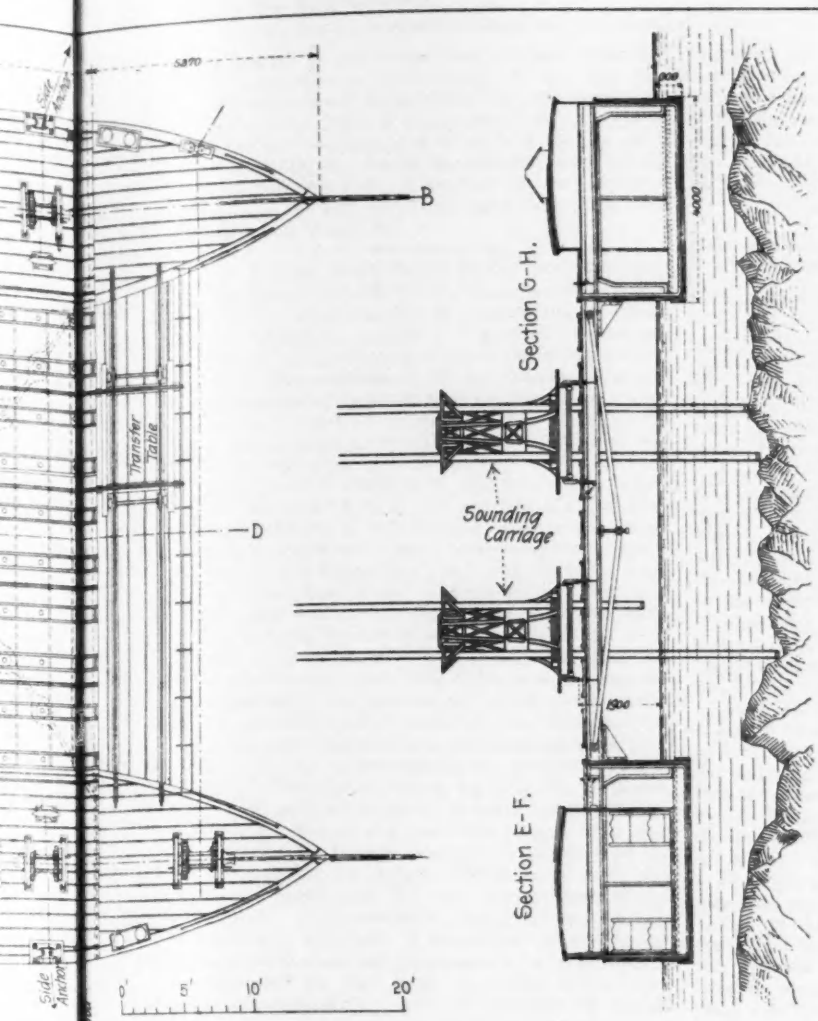


FIG. 3. TRANSVERSE SECTION OF SOUNDING BOAT.

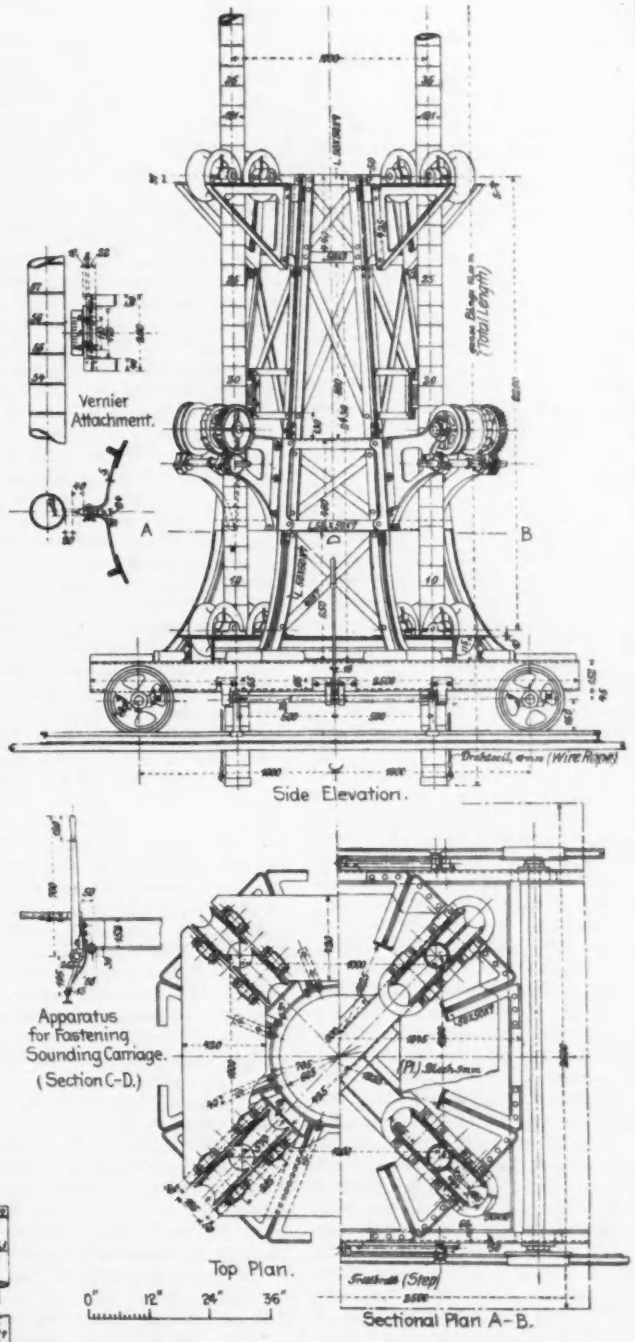
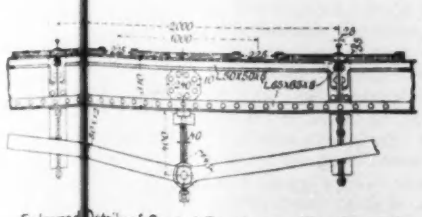


FIG. 1. DETAILS OF SOUNDING CARRIAGE.



Enlarged Details of Central Framing. (See Fig. 3.)

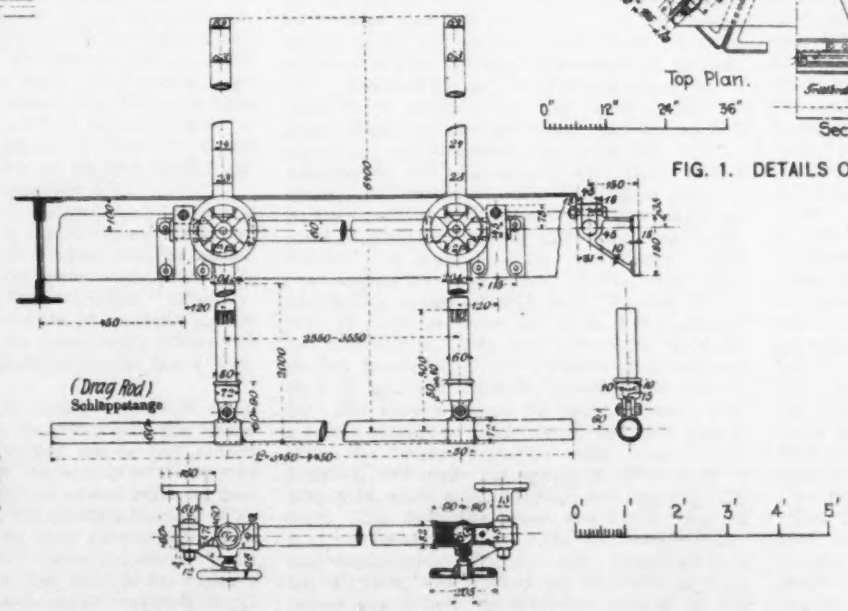


FIG. 4. ENLARGED DETAILS OF DRAG FRAME.

ON THE DANUBE RIVER IMPROVEMENT.

CHAS. HART & SONS, LITH., 90 VESEY ST., N. Y.

is profited by and a new start is made along the lines we have so often urged: (1) Let the city employ engineers to ascertain the best sources of supply, and lawyers to pronounce on the water rights involved, and then let the city ask for independent bids for construction and for water rights, thus securing wide competition for construction; or let it condemn the water rights desired, as any other city would do.

A question which should receive more attention from those in charge of city water supplies is the extent to which the sites of proposed storage reservoirs should be stripped of vegetation and of soil containing organic matter before the reservoirs are filled. The residents of Purdy's Station, a settlement adjoining reservoir M of the New York waterworks, complained recently of the odors which arose on drawing down the water in this new reservoir and exposing to the hot summer sun the vegetable matter which lined the site. Two years ago the water from a new reservoir in the Croton watershed was so objectionable to the consumers in this city as to give rise to much complaint. About that time a disinfecting plant was put in to treat the water from a new reservoir before it reached the city. When the big storage reservoirs built for Newark, by the East Jersey Water Co. were first put in use the consumers of the water expressed much disgust at the fluid which was delivered to them, during the greater part of one summer, the trouble being caused largely by the decomposition going on in the reservoirs, which might have been avoided, to a considerable extent, by previous stripping. The city of Boston, realizing that its water supply could be improved thereby, has been stripping the sites of new reservoirs of late. The sum of $2,950,000 is to be expended in similar work on the reservoir for Greater Boston, soon to be put under construction by the Metropolitan Water Board. Decomposition of organic matter, coupled, it is said, with lack of circulation and consequent stagnation, has made the water of a large storage reservoir for the supply of Butte, Mont., practically intolerable. Artificial aeration by means of air compressors placed on boats was contemplated this summer, we are informed by Mr. Eugene Carroll, Chief Engineer and Superintendent of the Butte City Water Co., but the water finally became so bad that the proposed remedy was given up as useless. Much trouble is experienced with bad water from a storage reservoir connected with the water-works of Middletown, Conn., as stated in a note elsewhere in this issue.

The extensive studies made by Prof. T. M. Drown on soils from the site of the reservoir mentioned above as to be constructed for Greater Boston were abstracted in our issue of Nov. 15, 1894. The conclusions drawn from these studies were that on a sparsely populated site, soil containing more than from 1½% to 2% of organic matter, as determined by loss of ignition at 212° F., should be removed, it being taken for granted that all vegetable matter would be removed also.

In most cases doubtless the qualities which cause bad tastes and odors in stored waters would not in themselves be harmful if taken into the human system, but sometimes the water tastes and smells so badly that it cannot be "stomached." Offensiveness of this kind is just ground of complaint against any water supply, and the water-works official who tries to convince the public otherwise has a large task on his hands.

The troubles caused by organic matter on reservoir bottoms and sides, are not wholly due to the decomposition of that matter, nor do they always cease after the reservoir has been in service a year or two. The accumulations named serve as food for low forms of life which at times increase to an enormous extent, and by their decomposition give rise to the most offensive tastes and odors. Years may elapse before these food supplies are exhausted, as is set forth in some detail regarding stored water at Springfield, Brockton, Leominster and other Massachusetts towns, in the special report, published in 1890, of the Massachusetts State Board of Health on the "Examination of Water Supplies," pp. 740 to 773.

It is to be hoped that the authorities of Jersey City may give this matter of cleaning reservoir sites due consideration before awarding contracts for a new supply. Each inhabitant of that municipality must have certainly absorbed his traditional peck of dirt long ago, from the Passaic River supply, and is fairly entitled now to as good and pure water as modern engineering skill can furnish.

THE DEVELOPMENT OF TRANSATLANTIC STEAM NAVIGATION.

The history and development of steamship traffic across the Atlantic Ocean have been written about at various times in books and periodicals, but in connection with the addition of the new American-built express steamers "St. Louis" and "St. Paul" (which are described and illustrated in another column) to the great fleet of modern Atlantic liners, it seems appropriate just now to give a general review of the development of passenger traffic between England and America. In preparing this review we have drawn much information from the historical chapters of the interesting work on "The Atlantic Ferry," by Mr. Arthur Maginnis, published in 1892, but have brought the records down to the present date. With the exception of some steamers for early but short-lived lines, the unlucky Collins line (which was started in 1849 and finally given up in 1858), and the present American line (which was started in 1871 and has now a fleet of eight American-built steamers and several foreign-built steamers), practically the entire transatlantic trade by steam navigation between America and England, has been in the hands of English companies, though some of the German lines stop at English ports. This has been largely due to adverse conditions of legislation and finance, which we will not now discuss.

To go back to the beginning of history in this direction, the first steamship to make the passage across the Atlantic was the "Savannah," built at New York in 1819 by direction of Col. John Stevens. It was a full-rigged ship, fitted with paddle-wheels, which could be taken on deck when the wind was such that the ship could sail faster than it could steam. The wheels were driven by a single inclined direct-acting steam cylinder, 40 × 72 ins., and the boiler pressure was 20 lbs. Only 80 tons of coal were carried, and the speed under steam alone averaged about six knots. This ship left Savannah, Ga., May 25, 1819, and reached Liverpool June 29, after a voyage of 35 days, steam being used on 18 days of the voyage. The next steamer was the "Royal William," built at Three Rivers, Quebec, in 1831, which was 160 ft. long, 44 ft. beam and 363 tons burden. It left Quebec Aug. 5, 1833, and reached London Sept. 16, after a voyage of over 40 days. Then came an English-built "Royal William," of 10 knots speed, which sailed from Liverpool for New York on July 5, 1838. This was the first vessel to have its hull separated into watertight compartments. It was followed by the "Liverpool" and the "British Queen," the former of which was 235 ft. long, 35 ft. beam, and of 1,150 tons burden, fitted with engines of 450 HP. driving side wheels 29 ft. diameter. On April 5, 1838, the "Sirius" sailed from Queenstown and arrived at New York April 24, after a voyage of 18½ days. It was 178 ft. long, 25 ft. 6 ins. beam and 18 ft. 3 ins. deep, of 703 tons burden. The wheels were 24 ft. in diameter, driven by side-lever engines with cylinders 60 × 72 ins., and the boiler pressure was only 15 lbs. The speed averaged 8½ knots per hour, with a daily consumption of 24 tons of coal. On April 8, 1838, the "Great Western" sailed from Bristol, England, and made the voyage to New York in 13½ days, while a later voyage was made in 12½ days. This really fine vessel was 236 ft. long, 35 ft. 4 ins. beam and 23 ft. 3 ins. deep, and of 1,340 tons displacement. The side wheels were 28 ft. 6 ins. diameter, and were driven at about 15 revolutions per minute by side-lever engines of 750 I. HP., having two cylinders 73½ × 84 ins. Steam was supplied by four return-flue boilers carrying 15 lbs. pressure and consuming about 33 tons of coal per day. There are people still living who remember the excitement in New York on the arrival of the "Sirius" and "Great Western." The "British Queen" made a few voyages in 1839, but the company collapsed soon after the loss of the "President" in 1841.

The "Great Britain" was an iron steamer built at Bristol in 1843 to run in service with the "Great Western." It was a screw-propelled vessel, endless chains transmitting the motion from the overhead crank shaft to the screw shaft. There were four inclined cylinders 80 × 72 ins., working upward, and the screw was six-bladed, of 25 ft. pitch, and 15 ft. 6 ins. diameter. The boiler pressure was 25 lbs., and the three boilers consumed 65 tons of coal per day. New engines were fitted in 1853, and in 1882 the ship was converted into a sailing ship, and was soon after condemned. Most of the above-mentioned steamers were run independently by separate owners, and were run more as experimental ventures than with any view of developing a regular line of steamship service, for which, however, they were the pioneers.

The Cunard Line was the first of the great transatlantic lines, and was started by Mr. (afterwards Sir) Samuel Cunard, a Canadian, who went to England in 1839 and obtained the co-operation of Mr. George Burns, of Glasgow, and Mr. David McIver, of Liverpool, in securing from the British government a subsidy of $300,000 per annum for a monthly mail steamship service from Liverpool to Halifax and Boston. The first steamer of this line was the "Britannia," which was launched on the Clyde in February, 1840. It was a wooden vessel, 207 ft. long, 34 ft. 2 ins. beam and 22 ft. 2 ins. depth, of 1,156 tons capacity, fitted with side wheels 28 ft. 6 ins. diameter, which were driven by side-lever engines with two cylinders 72 × 82 ins. The engines developed about 740 I. HP. and gave the ship a speed of about nine knots an hour. Steam was supplied by four return-flue boilers with 12 furnaces, the steam pressure being 20 lbs. per sq. in. and the coal consumption about 38 tons per 24 hours. There were four vessels of this type, and the "Britannia" commenced the service, leaving Liverpool on July 4, 1840, and arriving at Boston (after a stop of some hours at Halifax) on July 19, the record being 14 days 8 hours. In 1848 larger steamers, with engines of 1,000 I. HP., a coal consumption of 76 tons per day and a speed of 12¼ knots per hour, were put in service. The first iron steamer of the line was the "Persia," 1856; and the first screw steamer was the "China," 1862, this latter vessel having oscillating cylinders driving an overhead shaft, which carried spur-wheel gearing with pinions on the screw shaft. It is interesting to note that the "Russia," of this line, brought out in 1867, is now the "Waesland," of the Red Star Line, and was refitted in 1890 with triple-expansion engines. The older Cunard steamers now in service are the "Bothnia" and "Scythia," 1874, being the first fitted with compound engines; the "Gallia," 1879, having three-crank compound engines, and the "Servia," 1881. The "Aurania," 1882, introduced a revolution in design, the proportion of length to beam being about 8 to 1, while formerly it was 10 or 11 to 1. It was 470 ft. long, 57 ft. 3 ins. beam, and of about 13,300 tons. This was followed in 1884 and 1885 by the "Umbria" and "Etruria," of 13,300 tons, 500 ft. long and 57 ft. 3 ins. beam. These have three-crank compound engines, with one cylinder 71 × 72 ins. and two 105 × 72 ins. There are nine boilers and 72 furnaces, the pressure being 110 lbs. and the daily coal consumption 320 tons for a speed of 19 knots, with the engines indicating 14,000 HP. The latest vessels of this line are the well-known record-breaking twin-screw steamers "Campania," 1893, and "Lucania," 1894, described in our issue of Nov. 30, 1893, in which issue were also given some particulars of the older boats.

The Collins Line was started in this country in 1849 as a rival of the Cunard Line, and four wooden side-wheel steamers (the "Atlantic, "Pacific," "Arctic," and "Baltic") were built by William Brown, of New York city, the engines being built by the Novelty Iron Works, of New York city. The service was started by the "Atlantic," which left New York on April 27, 1849. These vessels were all 282 ft. long, 45 ft. 2 ins. beam and 32 ft. deep and 2,860 tons burden. Steam was supplied by four boilers, carrying 17 lbs. pressure

Notable Transatlantic Steamers from the "Savannah," 1819, to the "St. Louis," 1895.
(* American-built Steamers.)

Steamer.	Line.	Date of bldg.	Length.—Ov. all, ft.	Length.—Bt. prps., ft.	Bm., ft.	Dph., ft.	Ton'ge, tons.	Disp., tons.	Cylinders.—No.	Cylinders.—Diam., ins.	Cylinders.—Str., ins.	Blr. prss., lbs.	Spd., I. HP.	Spd., kts.	Blrs., No.	Fcs., No.	Side whl. or screw.	Engines.	Where built.	M's, No.	Smk. sks., No.	Diam. of wl., ft.	Coal con. per day, tons.
Savannah*	.....	1818	...	...	..	..	380	.....	1	40	72	20	.....	6	..	..	S. W.	Ind. dir. act.	New York	3	1	..	..
Sirius	.....	1837	178	...	25½	18¼	703	.....	2	60	72	15	.....	8½	..	..	" "	Side-lever	Glasgow	3	1	24	24
Gt. Western ..	Gt. West'n	1837	236	...	35½	23¼	1,340	.....	2	73½	84	15	750	8½	4	..	" "	" "	Bristol	4	1	28½	33
Britannia	Cunard	1840	250	207	34½	22½	1,156	2,050	2	72½	82	12	740	8¼	4	12	" "	" "	Greenock	3	1	28½	38
Gt. Britain ...	Gt. West'n	1843	324	275	48	31½	3,270	5,780	4	80	72	25	1,500	11	6	24	S.	Ind. cyls., geared	Bristol	4	1	15½	..
Arctic*	Collins	1849	286	277	45½	24	2,772	6,200	2	95	120	14	2,000	11¾	2	32	S. W.	Two side-lever	New York	3	1	35½	..
Vanderbilt* ...	N.Y.&Havre	1855	331	...	47½	24½	3,300	.....	2	90	144	18	.....	..	4	..	" "	Two walk.-beam	" "	2	2	41	..
Gt. Eastern ...	.....	1858	691	680	82¾	48¼	18,915	32,160	4	74	168	25	5,000	13	4	40	" "	Oscill.	London	.	.	..	..
									4	84	48	25	6,000	13	6	60	S.	Dir. act. hor.					
Scotia	Cunard	1862	400	379	47¾	30½	3,871	8,755	2	100	144	25	4,000	13½	8	40	S. W.	Side-lever	Glasgow	2	2	40	160
City of Paris..	Inman	1866	359	346	40½	26¼	2,051	6,411	2	89	42	30	2,000	14	8	24	S.	Dir. act. trunk	"	.	.	..	105
Oceanic	W. Star	1871	432	420	41	31	3,707	7,240	4	41 & 78	60	65	3,000	14¼	10	20	"	Tand. comp.	Belfast	.	.	..	65
Illinois*	American	1872	343	...	43	34½	3,119	.....	2	57-90	48	60	.....	..	..	..	"	Comp.	Philadel'a	.	.	..	..
Britannic	W. Star	1874	468	455	45¼	33¾	5,004	9,000	4	48-83	60	75	5,100	16	8	32	"	Tand. comp.	Belfast	4	2	..	110
Arizona	Guion	1879	473	450	45½	35½	5,147	9,300	3	(1)62-(2) 90	66	90	6,300	16¼	7	39	"	3-crank comp.	Glasgow	.	2	..	125
Servia	Cunard	1881	540	515	52	38	8,500	12,300	3	(1)72-(2)100	78	90	10,000	16½	7	39	"	" " "	"	.	2	..	..
City of Rome..	Anchor	1881	600	560	52½	37	8,000	13,500	6	(3)46-(3) 86	72	90	11,500	17½	8	48	"	3-cr. tan. comp.	Barrow	4	3	..	..
Alaska	Guion	1881	520	500	50	38	6,400	9,500	3	(1)68-(2)100	72	100	11,000	17¾	9	54	"	3-crank comp.	Glasgow	.	2	..	..
American	National	1884	459	432	51½	36	5,528	9,550	3	(1)63-(2) 91	66	95	9,500	18¾	7	39	"	" " "	"	2	2	..	190
Umbria	Cunard	1885	520	501	57½	38	7,718	15,300	3	(1)71-(2)105	72	110	14,500	19	9	72	"	" " "	"	3	2	..	320
New York	American	1889	560	527	63½	39¼	10,500	17,270	3	45-71-113	60	150	18,500	20	9	54	T. S.	3-cr. trip. ex.	"	3	3	..	300
Majestic	W. Star	1889	582	566	58	39½	9,800	16,740	3	43-68-110	60	180	17,500	20	16	76	" "	" " "	Belfast	3	2	..	300
Campania	Cunard	1893	620	600	65	42¾	13,000	21,000	5	37-79-88	60	165	31,000	21½	14	102	" "	" " "	Glasgow	2	2	..	..
St. Louis*	American	1895	554	535½	63	42	11,629	16,000	6	28½-55-77	60	200	20,000	19	10	64	" "	4-cr. quad. ex.	Philadel'a	2	2	..	360

and consuming about 85 tons of coal per day, with an average speed of 12½ knots per hour. No expense was spared in the construction and equipment, but the line was unsuccessful financially, owing, it is said, mainly to reckless expenditure and bad management, and it suffered severely from the disastrous loss of the "Arctic" by collision in September, 1854, and of the "Pacific," in 1856. Another fine steamer, the "Adriatic," was built in New York about 1855, and had oscillating engines with two cylinders 100 × 144 ins., developing 2,500 HP. with a boiler pressure of 20 lbs. The wheels were 40 ft. diameter, and at 17 revolutions per minute gave a speed of 13 knots on a coal consumption of 85 to 90 tons. The Collins Line was abandoned in 1858.

The Inman Line was started in England in 1850, running the steamers "City of Glasgow" and "City of Manchester" between Liverpool and Philadelpria. The former vessel was 258 ft. long, 34 ft. 3 ins. beam and 2,125 tons burden, with a screw propeller driven by geared beam engines of 350 HP. Steam was supplied by three boilers, with nine furnaces, and carrying 10 lbs. pressure. In 1869 the "City of Brussels" made an eastbound record trip of 7 d. 22 h. 3 min. This ship had direct-acting trunk engines, and attained a speed of nearly 13 knots per hour on a coal consumption of 110 tons per day, the boiler pressure being only 30 lbs. The "City of Berlin," still in service, was first run in 1875, and developed a speed of 16 knots on a daily coal consumption of 120 tons, the boiler pressure being 75 lbs. It had originally a two-cylinder compound engine, but was fitted with triple-expansion engines and the Howden forced draft system in 1887. The "City of Rome," built for this line in 1881, did not develop the expected speed, and was eventually sold to the Anchor Line. It is 546 ft. long, 52 ft. 3 ins. beam, and of 13,500 tons, with six-cylinder, three-crank compound engines, the cylinders, 46 and 86 ins. diameter, with a 6-ft. stroke, being placed tandem. The Inman & International Line placed in service the "City of New York" and "City of Paris" in 1888 and 1889, and the line is now owned by an American company (the International Navigation Co.), which has absorbed the old Inman, Red Star and American lines, has adopted the name of the "American Line," and has now added to its equipment the American-built steamers "St. Louis" and "St. Paul," which are described in another column.

The Anchor Line commenced its Glasgow and New York service in 1856 with the steamer "Tempest," as a secondary venture to its Mediterranean service, but the traffic increased so greatly that a weekly service was commenced in 1863. The Allan Line was started in 1854 with the "Canadian" running between Liverpool and Montreal. This steamer was 278 ft. long, 34 ft. beam, of 1,873 tons, having a screw propeller driven by direct-acting engines, the boiler pressure being 12 lbs. This line does not enter the lists with express steamers. The National Line was started in 1864, and was the first to use compound engines, the original engines of the "Holland" being compounded in 1869. The only boat of notable speed ever run by this line was the "America," 432 ft. long, of 5,528 tons, which began service in 1884, and made a record trip of 6 d. 14 h. 18 min., but was sold to the Italian government in 1886, as no satisfactory service could be maintained with one boat, and the company did not care to go to the expense of another express steamer, and this line now maintains a freight service. The "America" had three-cylinder, three-crank compound engines, and the boilers were worked at 95 lbs. pressure. The Guion Line (which was abandoned about a year ago) was started in 1866, with the screw steamer "Manhattan," of 2,869 ton, and was at one time a famous line, being specially noted for its fast steamers "Arizona" and "Alaska," of about 5,164 tons. The second of these, brought out in 1882, was the first steamer to cross the Atlantic in less than seven days. They had compound engines with one high-pressure cylinder, 62 × 66 ins., and two low-pressure cylinders, 90 × 66 ins., placed one on each side of the high-pressure. The boiler pressure was 90 lbs. and there were seven boilers, with 39 furnaces, the coal consumption being about 125 tons per day.

The White Star Line is a younger venture than any of the preceding, the first steamer having been the "Oceanic," put in commission in 1872. It was 420 ft. long, 41 ft. beam, of 3,601 tons, and had four-cylinder tandem compound engines, with cylinders 41 and 78 ins. diameter and 60-in. stroke, supplied by steam at 65 lbs. pressure from 12 boilers consuming only 65 tons of coal per day for a speed of 14½ knots per hour. The famous "Britannic" and "Germanic" were brought out in 1874 and 1875, and closely resembled the "Oceanic," except that they were somewhat larger, of 5,004 tons, and with a boiler pressure of 75 lbs. consumed 110 tons per day for a speed of 16 knots. The engines were as above described, with cylinders 118 × 60 and 83 × 60 ins. These were the first ships to reduce the record below 7½ days, and the "Germanic," having during the present year been fitted with triple-expansion engines and new boilers, has lately shown a considerable increase in speed, having made a westbound passage in July, 1895, in 6 d. 23 h. 27 min.

The newest steamers of this line, the "Teutonic" and "Majestic," and their records, are too familiar to need description here. This line runs special cattle and freight steamers of large size, and has also a service from San Francisco to China, Japan and Australia.

After the failure of the Collins Line all the transatlantic steamers between Great Britain and the United States were operated by English companies until in 1871 the American Line was started in Philadelphia, and in 1872 the four iron screw steamers "Ohio," "Indiana," "Pennsylvania" and "Illinois" were built at the Cramps shipyards in Philadelphia. These are all 343 ft. long, 43 ft. beam and 3,119 tons capacity, having two-crank compound engines with cylinders 57 × 48 and 90 × 48 ins., the boiler pressure being 60 lbs. The same line also owned some English-built steamers. In 1887 the "Ohio" was fitted with triple-expansion engines, new boilers and the Howden hot draft system. These four ships were the first modern Atlantic liners to carry the American flag, but when the company absorbed the old Inman Line an Act was passed admitting the "New York" and "Paris" to American register. There were, however, other early American steamers built for the transatlantic service, including those of the Ocean Navigation Co., which started in 1847, running from New York to Bremen, and the "Arago," "Fulton" and "Vanderbilt," of the New York, Southampton & Havre Steamship Co., the three latter vessels being wooden steamers built in New York in 1855. They were side-wheel steamers, the first two with oscillating engines and the last with walking-beam engines. Each had two smoke-stacks and two square-rigged masts. The line did not prove a financial success, however, and the ships went into other service. The "Fulton" carried 300 passengers and 700 tons of freight. The largest of these three steamers was the "Vanderbilt," 331 ft. long on the deck, 47 ft. 6 ins. beam and 24 ft. 6 ins. deep, or 32 ft. 6 ins. from the spar deck, with a tonnage of 3,360 tons. There were two vertical walking-beam engines, built at the Allaire Works, New York, and having cylinders 90 × 144 ins. These drove wheels 41 ft. diameter, with 36 buckets or floats 10 × 2 ft. Steam was supplied by four horizontal return-tubular boilers, carrying a steam pressure of 18 lbs. per sq. in. In these old side-wheel ocean steamers the decks did not usually extend out on "guards" to the outer line of the paddle-boxes," as in sound and river steamers, but were merely the same width as the hull, and the general appearance of the vessels of this class may still be seen in that of the coasting steamer "Old Dominion," of the Old Dominion Line, which is still running between New York and Virginia ports. Some of the Pacific steamers did, however, have the upper deck extended over the guards.

It is by no means to be inferred that because so few steamers for the transatlantic service have been built in this country that therefore commercial steam shipbuilding in America has been confined to lake and river steamers for domestic commerce. Large numbers of steamers have been built for the coasting Pacific and South Atlantic service, and while these do not rank with the immense express liners of the transatlantic service, many of them are large and swift vessels that reflect great credit on their designers and builders.

By far the greatest proportion of the leading transatlantic steamers are owned by British companies, but there are also several well-known continental lines, three of which run express steamers. The Hamburg-American Line started in 1856 with the "Bourssia," an iron screw steamer built at Glasgow, having inverted oscillating cylinders. The most notable of the modern vessels of this line are the "Columbia" and "Normannia," built in England, and the "Augusta-Victoria" and "Fuerst-Bismarck," built at Stettin. These are all express steamers, and the last-named was described and illustrated in our issue of March 23, 1893. The North German Lloyds Line, from Bremen to New York, commenced its transatlantic service in 1858 with the iron screw steamer "Bremen," built at Glasgow. This vessel was 318 ft. long, 40 ft. beam,

of 2,674 tons, having inverted direct-acting engines of 2,500 I. HP. This line has now six express steamers, including the "Lahn" and "Spree," about 463 ft. long, 52 ft. beam, of about 6,900 tons, with triple-expansion twin-screw engines of about 8,000 HP. Some of these were built in England and some in Germany. The French Transatlantic Line (Compagnie Generale Transatlantique) started in 1862 to run English-built steamers between Havre and New York, but since 1882 the company (which has steamers running to all parts of the world) has built its vessels at its own works. The "Bourgogne," "Champagne," "Bretagne" and "Gascogne" are all express steamers, about 495 ft. long, 52 ft. beam, of 6,900 tons, and are fitted with six-cylinder compound three-crank engines. The newest boat, the "Touraine," is 521 ft. long, 59 ft. beam and having a gross tonnage of 9,057 tons. It has triple-expansion engines. These are practically all of the continental lines running express steamers.

As already noted, we have dealt here mainly with the vessels of historical interest and with the newer vessels which are noted for size and speed. The lines now furnishing express steamship service and the number of their express steamers (each company having a number of other slower and smaller steamers) may be listed as follows:

United States, 4—	
American Line	4
England, 10—	
Cunard Line	6
White Star Line	4
France, 5—	
French Line	5
Germany, 10—	
North German Lloyds	6
Hamburg-American	4

LETTERS TO THE EDITOR.

THE COST OF STREET SPRINKLING AT ST. PAUL, MINN.

Sir: The questions in regard to street sprinkling, raised by Mr. Jas. W. Johnson in Engineering News of July 18 are answered, in part at least, by the attached extract from the report of this department for 1894, giving information as to the results obtained and cost of service in St. Paul.

The letter of Mr. Johnson and your comments bring up a subject which should receive the attention of all engineers preparing municipal reports; that is, the results obtained ought to be expressed in such a way that the reader of the reports can compare these results with those obtained by him elsewhere. To this end it is hoped that the attention of all engineers preparing such reports may be drawn to the great common benefit that would be derived from reports that would admit of intelligent comparison if made on a uniform basis.

Geo. L. Wilson,
Assistant City Engineer.

St. Paul, Minn., July 22, 1895.

(The extract, which is printed below, is from Mr. Wilson's report as Assistant City Engineer. It does not state, however, the frequency of sprinkling, and the last sentence did not appear in the printed report, but was appended in writing by Mr. Wilson.—Ed.)

The price of sprinkling for the past season has been less than for any previous year, owing to the competition among bidders, the price varying from 24¾ to 26.9 cts. per 100 ft. per week, or from $12 to $14.20 per mile per week. The sprinkling began April 26 and ended Oct. 31. The cost per front foot to the property owner is from 4¾ to 5.3 cts. for the entire season. These prices include the payment of 10 cts. per 100 ft., or $5.28 per mile per week, to the water department for the water used. To determine the approximate amount of this, all the sprinkling tanks were measured and the loads used each day were counted for four successive days each month from July to October. In this manner the water used on 108.8 miles was found to be as follows:

Ave. for July & Aug., gallons per mile per day...15,100
" " four months, " " " " " ...11,580
" " July & Aug., " " 100 ft. per week. 2,008
" " four months, " " " " " .. 1,527

A similar determination during a previous year gave 1,378 gallons per 100 ft. per week.

It may be estimated that, for the entire season of six months, an average of 1,400 gallons per 100 ft. per week, or 73,920 gallons per mile, is used. This result gives the price paid for water 7.14 cts. per 1,000 gallons.

The total cost of street sprinkling for 113 miles for six months was $37,788, of which amount the water department received $15,651.

The distance sprinkled per team during the driest weather varied from 1.5 to 2.5 miles per day. The tanks used held an average of about 500 gallons each; each team used from 45 to 55 loads per day. The roadways average 40 ft. wide; 40 miles of these streets are paved, the balance are earth surface.

THE ELASTIC LIMIT IN STEEL.

Sir: It is to be hoped that your review of the subject of elastic limit and yield-point in your issue of July 25 may be carefully read by every engineer. From it may be readily deduced the relative value of elastic limits and yield-points taken by the dividers, the scale beam drop, or the extensometer, as well as the relative values of the terms themselves.

One of the most important things touched upon in the discussion of this matter is the fact that the common scale-beam elastic limit may be varied with the speed of the testing machine, which is not generally provided for in specifications, and which, if not known, may render the comparison of results misleading.

The following table is from the investigations of Mr. H. H. Campbell, of the Pennsylvania Steel Co. (Trans. Am. Soc. C. E., April, 1895, p. 327):

Influence of Speed of Testing Machine Upon Recorded Strength, Elastic Limit, Etc.

Pulling spd., ins. per min.	Ult. stgth., lbs. per sq. in.	Elas lim., lbs. per sq. in.	Elastic ratio.	Elong'n in 8 ins., %.	Reduction of area, %.
4.50	61,075	45,708	74.84	30.32	64.96
3.00	60,672	44,410	73.20	30.18	64.83
0.67	59,523	42,904	72.08	29.45	65.82
0.38	59,387	41,763	70.32	29.33	65.69
0.07	59,027	39,647	67.17	31.98	66.48

From this table it will be seen that the elastic limit may vary 6,000 lbs. between pulling speeds of about 1-16 in. per min. and 4½ ins. per min., while the other results do not show any very remarkable variation.

Your suggestion that the elastic limit be taken with the old-style hand-wheel is open to objection. In the first place, it necessitates a change in the modern testing machine, and greatly increases the time and labor of making tests, which is now an important factor.

It must not be forgotten that ordinary testing is not, primarily, a scientific investigation. In a broad sense the object of an ordinary test is to determine the grade of the material, and as far as may be its quality and the effects of the various mill manipulations upon it. This, in connection with the analysis and various physical tests, gives the engineer the information he seeks. After the tests have served their original purpose they may become the subject of scientific investigation, and for this purpose all the information possible should be given with them. With the modern testing machine a certain maximum speed could be specified, or it could be required that the speed used should be recorded. If a safe minimum limit be specified, it matters little whether it be called the elastic or the yield-point.

So far, the assumption that one-half the ultimate strength is a safe minimum limit has not been seriously attacked.

Before condemning them, it should be remembered that the present methods of testing are not a sudden development, but have simply been forced to keep up with modern production, and that to-day tests must be made upon thousands of tons of material where formerly they were made upon hundreds.

A. C. Cunningham.

Wayne, Pa., Aug. 10, 1895.

(The table given by Mr. Cunningham seems to indicate that the ultimate strength as well as the elastic limit is affected by the speed of the testing machine, although not to the same degree, the apparent increase of strength when the pulling speed is 4.5 ins. per min., as compared with a speed of .07 in. per min., being 2,000 lbs. per sq. in., while the apparent increase of elastic limit is 6,000 lbs. per sq. in.—Ed.)

THE SANITARY WORK OF THE WISCONSIN STATE BOARD OF HEALTH.

Sir: In your issue of July 5 you state in an article on the healthful and sanitary conditions of the different states that Ohio, Iowa and some of the Eastern states are paying a good deal of attention to the relation of sewerage and water supply to each other, and that the boards of health of those states are very active in preserving good sanitary conditions.

I was sorry to see our own state left out of this group, for I think Wisconsin is one of the active states in this particular. Our sister city, Chippewa Falls, has just been restrained the past week by the State Board of Health from emptying the sewage of an insane hospital in the river above the water-works intake, and a sewage farm is now talked of as a remedy. A short time ago the city of Madison was restrained from flowing its sewage into Lake Mendota, where the ice companies got their ice, diphtheria being caused from using the ice.

These and other instances show, I think, that Wisconsin has an active and energetic Board of Health, on the "qui vive" for irregularities in existing and proposed sanitary conditions. Yours,

C. A. Alderman, C. E.

Eau Claire, Wis., July 10, 1895.

(Our comments were upon the powers of approval or disapproval of water supply and sewerage projects conferred by the people of Massachusetts, New York and Ohio upon their State Boards of Health and the way in which these powers are exerted. The Wisconsin statutes, so far as we know, do not compel any city, town or public institution to submit water and sewerage schemes to the State Board of Health before carrying them out, and therefore that state was not mentioned in the note to which reference is made. If the Wisconsin Board of Health can effectually and speedily intervene to prevent the pollution of public water supplies, the people of that state are to be congratulated. But it is always better to lock the barn before the horse is stolen, so while the last-named Board may deserve high praise for doing all within its power, the state will not take first rank in sanitary matters until it clothes the Board with power to prevent the construction of any sewerage system which may lead to the pollution of water supplies.

The assertion that diphtheria was caused by using ice from a lake which received the sewage of Madison cannot be passed by without the counter statement that the best authorities do not consider this a water-borne disease. This does not indicate that the pollution of Lake Mendota was harmless, but simply points to the real sources of danger—typhoid fever and diarrhoeal diseases, which doubtless were had in mind when it was insisted that sewage must no longer be discharged into the lake.—Ed.)

EARTHWORK TABLES.

Sir: A correspondent in your issue of May 16 inquires in regard to certain tables of earthwork for preliminary estimates, to be used when the center depth and angle of transverse slope are given. I have never seen the tables referred to, and have often wondered that no such tables are given in ordinary field-books, as it is almost impossible to make an estimate in rough country without them.

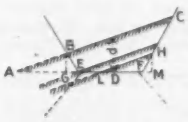
I have had a number of such tables worked out by my classes during the last two years, and as the method used might be of interest to those having occasion to use the tables, I enclose a blueprint copy, as well as a specimen table. Yours, etc.,

E. A. Kemmler,
Asst. Professor of Civil Engineering.

Ohio State University, Columbus, O., May 21, 1895.

(We print below the method of computation given by Prof. Kemmler. Blueprint specimens of tables computed by this method can doubtless be obtained from him.—Ed.)

The tables are calculated for 50-ft. sections and for transverse slope of ground varying from 0° to the limit $s = s'$, where s = the slope ratio of cross-section and s' = cot. of slope of ground. To obtain the quantity for 100-ft. sections take out the quantities for the depth and slope at the two ends and take their sum. In the figure let d = center depth; b = base; l = 50 ft., and s and s' as above. When the slope intersects the base, E F, as at L, or when $\pm d$ is less than $\frac{b}{2s'}$, in the triangle L H F:



$$L F = H M (s' - s) = \tfrac{1}{2} b + d s'$$

$$H M = \frac{\tfrac{1}{2} b + d s'}{s' - s}$$

Therefore area $(A) = \frac{H M \times L F}{2} = \frac{(\frac{1}{2} b + d s')^2}{2 (s' - s)}$, and contents (cubic yards) $= \frac{1}{27} A = \frac{50}{54}\left[\frac{(\frac{1}{2} b + d s')^2}{(s' - s)}\right]$. (1)

When the ground intersects the side slope as at B, or when $\pm d$ is greater than $\frac{b}{2s'}$, the triangle A B E must be subtracted from the result obtained by formula (1).

$$A B E = \frac{A E \times B G}{2}$$

$$B G = \frac{d s' - \tfrac{1}{2} b}{s' + s}$$

$$A E = B G (s' + s) = d s' - \tfrac{1}{2} b$$

Therefore $A B E = \frac{(d s' - \tfrac{1}{2} b)^2}{2 (s' + s)}$

$$\text{Contents} = \frac{50}{54}\left[\frac{(\frac{1}{2}\,b + d\,s')^2}{s' - s} - \frac{(d\,s' - \frac{1}{2}\,b)^2}{s' + s}\right]$$

This reduces to $\frac{50}{27}\left(\frac{d^2\,s\,s'^3 + d\,b\,s'^2 + \frac{1}{4}\,b^2\,s}{s'^2 - s^2}\right)$ (2)

Equations 1 and 2 are equations of the second degree with respect to d; s' is constant for each column in the tables; hence $\frac{d^2\,s}{d\,d^2}$ is constant, and is equal to twice the coefficient of d^2, and the first difference between any two consecutive values of d is found by substituting for d in the first derivative $\frac{d_n + d_{n+1}}{2}$. The table for any value of s' can then be found by successive additions of first and second differences. Taking equation (1) first: X = cubic yards, for d = ± n; Y = first difference; Y' = second difference. Then

$$X - n = \frac{50}{54}\left(\frac{(\frac{1}{2}\,b - n\,s')^2}{s' - s}\right)$$

$$\frac{d\,s}{d\,d} = \frac{50}{54}\,\frac{(b\,s' + 2\,d\,s'^2)}{(s' - s)}$$

$$Y\ (\text{between } -n \text{ and } -n+1) = \frac{50}{54}\left(\frac{b\,s' + (1 - 2\,n)\,s'^2}{s' - s}\right)$$

$$Y' = \frac{100\,s'^2}{54\,(s' - s)}$$

From equation (2)

$$X = \frac{50}{27}\left(\frac{(n^2\,s\,s'^2 + n\,b\,s'^3 + \frac{1}{4}\,b^2\,s)}{s'^4 - s^2}\right)$$

$$Y\ (\text{between } d_n \text{ and } d_{n+1}) = \frac{100}{54}\left(\frac{(2\,n+1)\,s\,s'^2 + b\,s'^3}{s'^2 - s^2}\right)$$

$$Y' = \frac{100\,s\,s'^2}{27\,(s'^2 - s^2)}.$$

Example: b = 18; s = .25; s' = cot. 60° = 0.57735

$$\text{limit of d in equation (1)} = \pm\frac{18}{1.15470} = \pm 15 \text{ ft.} +$$

X (− 15) =	0.3264	
Y (− 15 and − 14) =	2.0526	from (1)
Y' =	1.8856	
X (+ 15) =	882.1065	
Y (15 and 16) =	58.6928	from (2)
Y' =	1.1396	

Then work table from − 15 to + 15 by (1) and from + 15 upwards by (2).

The following table will illustrate the method of addition:

	X.	Y.	Y'.
− 15	0.3264	.....	.....
− 14	2.3790	2.0526	.....
− 13	6.3172	3.9382	1.8856
− 12	12.1410	5.8238	1.8856
− 11	19.8504	7.7094	1.8856
	etc., to + 15.		
+ 15	882.1065	.....	.....
+ 16	940.7993	58.6928	.....
+ 17	1,000.6317	59.8324	1.1396
+ 18	1,061.6037	60.9720	1.1396
+ 19	1,123.7153	62.1116	1.1396
	etc., as far as desired.		

NOTES AND QUERIES.

The address is desired of Mr. Wm. Edward Burke, who was in the employ of the Pennsylvania R. R. about seven years ago as a civil engineer. He is of Irish parentage and is now about 30 years of age. Any one who can furnish information concerning him will please address John Usborn, C. E., General Delivery, Columbus, O.

Electric buoys have been located to mark Gedney's Channel at the entrance to New York harbor, and the plant is described in the "Electrical Engineer." The channel is about two miles long, and 1,000 ft. wide, and it is lighted by ten buoys, five upon each side, placed at distances of from 2,200 to 3,300 ft. apart. The western end of the channel is 10,860 ft. from the "Hook beacon" on Sandy Hook. A cable carries the alternating current used for lighting the lamps from the Hook beacon to the nearest buoy on the southern side of the channel, and thence to the other buoys on the southern side, then crosses over to the northward and supplies the five buoys on the northern side. Alternating current of a frequency of 40 cycles per second is used, supplied by two multipolar, four-pole alternators, making 1,200 revs. per min. The primary voltage is 1,000, and at the lamps it is reduced to 100 volts by means of a 600-watt transformer filled with oil, fitted inside of the head of each wooden buoy. Each buoy consists of a stout pole about 70 ft. long, anchored by a heavy "mushroom" weight. The lamps, which are fitted to the top of each pole and covered with a bell glass globe, are of 100 c. p., and each requires from 3½ to 4 amperes of current. The cable for this work was furnished by the Bishop Gutta Percha Co., of New York, and the electrical installation was furnished by the General Electric Co. A similar electric lighted "lane" is also provided in the Southwest Spit, but a continuous current of 150 volts is used.

CHICAGO MAIN DRAINAGE CHANNEL. XIII.

Sections 5 and 6, Lemont Division.

Section 5.—The original contract for this section was let to Agnew & Co., of Chicago, Ill., July 22, 1892. On the same date the contract for Sections 6 and 7, and on July 27 the contracts for Sections 8 and 9 were let to the same firm. From the beginning the contractors showed little disposition to equip their sections with the necessary plant for economically and effectively prosecuting work of so great a magnitude, despite frequent warnings and protests by the officers of the Sanitary District. In his report of Dec. 18, 1893, the Superintendent of Construction called especial attention to the backward condition of the work on Sections 5 to 9, inclusive, and on Dec. 27, 1893, the Board of Trustees served notice upon Agnew & Co. that there had been a substantial failure on their part to comply with the requirements of the contract. This notice was given in order to lay a foundation for a notice of forfeiture, but before actual forfeiture was declared Agnew & Co. assigned their contracts to other parties, with the consent of the Board of Trustees. The contract for Section 5 was assigned to the Qualey Construction Co., which firm has carried on the work since.

According to the latest revised estimates there are 1,064,021 cu. yds. of glacial drift excavation, 265,833 cu. yds. of rock excavation and 73,424 cu. yds. of retaining wall on Section 5. The prices for this work are 27 cts. per cu. yd., 73½ cts. per cu. yd. and $3.25 per cu. yd., respectively. Steam shovels, locomotives and cars and incline hoists have been used to excavate the glacial drift, and loam to clay and sand, and in places to a hard conglomerate of cemented gravel and boulders. Much the larger part of the material, however, is clay overlying a softer earth, and has caused considerable trouble from slips and subsidences. In one instance a slip of the bank buried the steam shovel at work on it until only the tip of the smokestack was visible.

Three steam shovels are used to excavate the glacial drift; one Bucyrus Special Contractor's, one Bucyrus No. 1 Boom and one Barnhart's AA type. It is not possible to secure records of the work of individual shovels, but in December, 1894, and January, 1895, the No. 1 Boom and the Barnhart

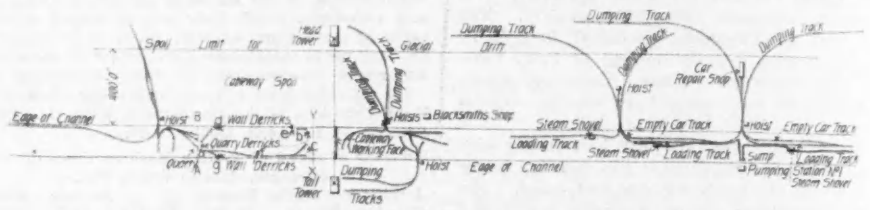


FIG. 58. PLAN OF TRACK SHOWING METHOD OF WORK ON SECTION 5.

shovels together worked 25½ and 29 ten-hour shifts, and averaged 290 cu. yds. and 345 cu. yds. per shift, respectively, for the two months.

The steam shovels load into dump cars of 1½ cu. yds., 2 cu. yds., and 3 cu. yds. capacity, which are hauled to the bottoms of the inclines by small locomotives, and thence up the incline by wire rope and hoisting engines. During the first few months of the work the locomotives hauled the cars all the way to the spoil bank, but this system was changed to the incline hoist system later. Considerable material has been taken out by hand, loading into dump cars, which are hauled to and up the inclines as just described, but no very useful records of the efficiency of this system are available.

As stated above, the solid rock on this section is being taken out by incline hoists and by a Lidgerwood cableway. The incline hoists for rock are operated much the same as those for glacial drift, the cars being loaded by hand. The cableway is operated in the manner already described for

FIG. 59. VIEW SHOWING QUARRIES AND RETAINING WALL WORK ON SECTION 5.

incline hoists and a traveling cableway to excavate the rock, except that quarried for building the retaining walls. Fig. 58 is a general plan showing the arrangement of the tracks, derricks, etc., for earth and rock excavation and for building the retaining wall.

Taking up the glacial drift excavation first, it will be noticed that its excess over rock excavation is much greater than on either of the three sections preceding. This is due to a sudden dip in the rock which underlies Sections 4, 5 and 6, beginning on Section 4 and ending on Section 6, and forming a pocket filled with glacial drift. On Section 5 there is much more variation in the character of the glacial drift than on Section 4, or, indeed, on Section 6, the material varying from light

preceding sections, and calls for no especial mention. According to the reports of the Superintendent of Construction, this cableway worked 20½ 10-hour shifts in December, 1894, and 9.1 shifts in January, 1895, and took out 217 cu. yds. and 275 cu. yds. per shift, respectively, for those two months. No reports of the cableway work could be obtained from the contractors.

On Section 5, as well as on the four sections preceding, the construction of the retaining walls on each side of the channel constitutes a very considerable portion of the work. Figs. 58 and 59 show the manner of doing this part of the work. The glacial drift and top layer of solid rock are taken out as has just been described, leaving just enough rock to be excavated to build the retaining

walls. The lower layer of rock is then quarried and built into the walls; the rock at each point of the channel sufficing for the walls opposite that point. It may be stated here that this convenient location of the rock is not the condition all along the retaining wall channel. On many of the sections good rock for masonry can be secured for a limited length of the section only, and this has to be transported a greater or less distance to the walls. These various conditions will be described in their proper place. The accessibility of good rock on Section 5 has, of course, simplified and cheapened the cost of retaining wall work proportionately.

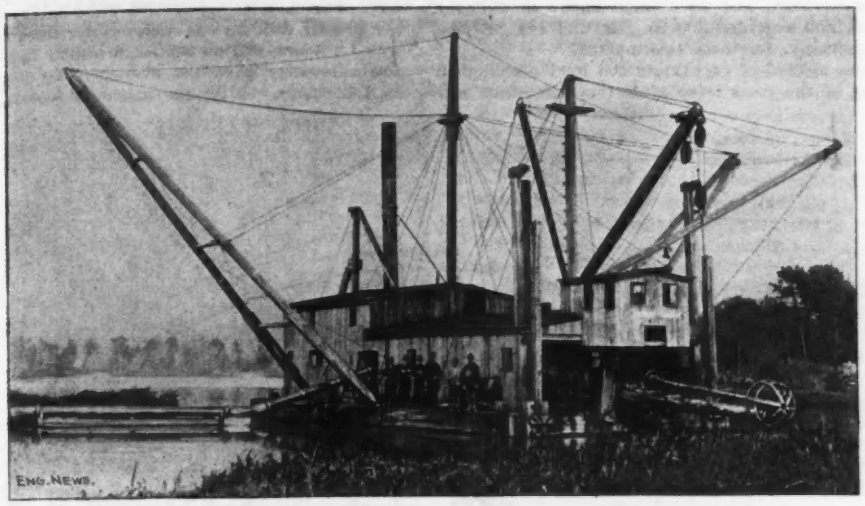


FIG. 60. VIEW OF HYDRAULIC DREDGE AT WORK ON SECTION 6.
Charles Vivian & Co., Builders and Contractors.

The plan, Fig. 58, shows the quarry faces at AB and ZY. Close to the quarry faces are placed the quarry derricks a b c, and from each of these a track runs to one of the wall derricks, d, e, f, g, as shown. The rock is quarried in suitable dimensions, loaded onto cars by the quarry derricks, hauled to the wall derricks and lifted by them to its place in the walls. Fig. 59 shows a section of completed wall. Beginning at the middle of the section the retaining walls are carried along toward each end, the channel being practically completed as the walls are completed. From Fig. 59 some idea of the fine appearance of the retaining wall channel may be obtained.

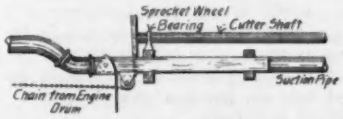


Fig. 61. Sketch Showing Manner of Applying Power to Cutter Shaft.

We are indebted to the Qualey Construction Co. and to the engineers of the Sanitary District for much aid in securing the matter from which the description of this section has been prepared.

Section 6.—Like Section 5, this section was originally in the hands of Agnew & Co., but was assigned to the present contractors, Mason, Hoge & Co., early in 1894. The artificial river diversion channel, which was discontinued at the east end of Section 5, begins again at the east end of Section 6, and continues through Sections 7, 8, 9, 10 and about one-half of Section 11, a distance of about 5¾ miles. This is the longest continuous section of river diversion channel on the work. From about the middle of Section 6 to about the middle of Section 11, the old channel of the Desplaines River crossed the route of the main channel six times, and the west half of Section 6 and the east end of Section 7 were covered with the waters and mud flats of that stream.

According to the latest revised estimates, there are 803,964 cu. yds. of glacial drift excavation, 549,118 cu. yds. of solid rock excavation and 33,736 cu. yds. of retaining wall on Section 6. Of the glacial drift excavation 118,808 cu. yds. were from the river diversion channel. The price for glacial drift excavation is 27 cts. per cu. yd., for solid rock 73½ cts. per cu. yd., and for retaining wall $3.25 per cu. yd.

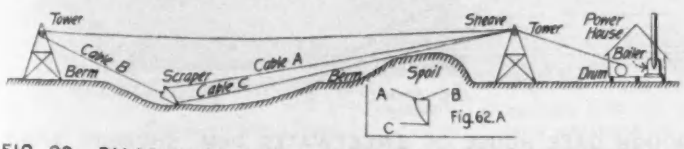


FIG. 62. DIAGRAM SHOWING MANNER OF OPERATING POWER SCRAPER ON SECTION 6.

When Mason, Hoge & Co. assumed control of the work on Section 6 they found a hydraulic dredge working in the soft muck of the old river bed at the west end, but little else was being done. The work was not only far behind in its progress requirements, but was in such shape that the new contractors had to expend considerable time and labor to get it ready for the installation of an adequate excavating plant. The dredge work at the west end had been practically the only effective work done. This dredge had been installed by a subcontractor, Chas. Vivian & Co., under Agnew & Co., and was afterward continued at work under an agreement with the Sanitary District. By agreement Mason, Hoge & Co. assumed the contract with the dredge people when they took the section.

The dredge was a rather makeshift affair, but it did exceedingly good work. Fig. 60 is a view of this machine. The machinery was carried on a flat-bottomed barge, and housed over, as shown by the illustration. Briefly described, it consisted of a 12-in. Heald & Sisco centrifugal pump, operated by means of a belt run by a Lidgerwood hoisting engine. The boiler for this engine was horizontal and of about 80 HP. A 20-HP. boiler ran the small engine operating the cutter at the end of the ladder carrying the suction pipe. The ladder was hinged at the top to swing up and down vertically, and the barge swung back and forth on a rear spud as a pivot, power for these movements being obtained through a hand windlass.

The ingenious and simple manner in which the cutter shaft was operated is worthy of notice. Ordinarily a somewhat elaborate mechanism is necessary to convey the power over the hinged joint at the top of the ladder, and still permit of free movement. The method of accomplishing this object here is shown in the accompanying sketch, Fig. 61. The cutter itself was equally simple, consisting merely of a basket-like arrangement of steel straps as clearly shown by Fig. 60. A flexible rubber joint allowed the movement of the suction pipe. This dredge complete would have cost probably from $10,000 to $12,000, if all the machinery had been new, but as second-hand machinery was largely used the actual cost was much less.

Altogether some 240,000 cu. yds. of muck were taken out with the dredge, and its average output was from 65 to 67½ cu. yds. per hour. It will be seen that for the amount of work it had to do, the dredge was astonishingly economical and efficient. As one contractor forcibly expressed it, "Vivian went down there, and with two second-hand Lidgerwood hoisting engines and a hoop skirt on the end of a pole, took out more stuff than any other man on the canal." The price received for taking out muck with the dredge was 22 cts. per cu. yd.

Considerable material was also taken out with a

FIG. 64. VIEW OF HYDRAULIC DREDGE WORK AND REVETMENT ON SECTION 6.

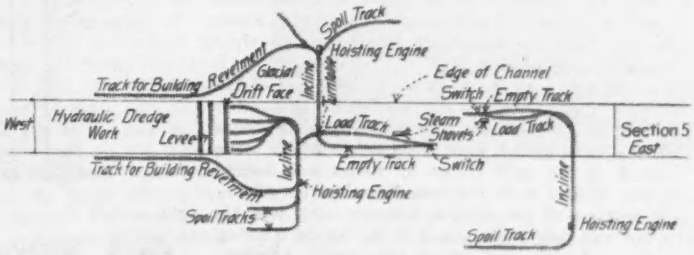


FIG. 63. PLAN OF TRACK SYSTEM SHOWING METHOD OF WORK ON SECTION 6. Mason, Hoge & Co., Romeoville, Ill., Contractors.

power scraper designed by the same contractors, Chas. Vivian & Co. The manner of operating this scraper is shown by Fig. 62. This scraper moved material at a very large profit in the summer, but was not an economical machine in cold weather. The output was some 24 to 24½ cu. yds. per hour in summer. In the spring of 1893 this machine was reconstructed to run two scrapers side by side, but the boiler capacity was not sufficient to supply steam for both, and although both scrapers were in use, they did not often work at the same time.

The scraper was of the same shape as an ordinary drag scraper. The steam plant was on a platform on the north side of the channel, back of the spoil bank, and in front of it was a wooden tower to hold the sheaves to support the cables. On the south berm there was a similar but lighter tower for the same purpose. The arrangement of the plant is clearly shown in the illustration.

There were three cables running to the scraper. One of them, cable A, was used to tip the scraper on end; cable B drew it out into the pit, and cable C hauled it out of the pit. The method of working was as follows: When the scraper had been drawn into the pit and was in the position shown in Fig. 62, cable A would be hauled in sufficiently to stand the scraper on its end, as shown in Fig. 62a. Cable C would then be hauled in, and the scraper would fill as it resumed its original position, and would be drawn to the spoil bank. Then cable A would turn it over and drag it a few feet to empty it, after which cable B would turn it right side up again and draw it back to the position shown in Fig. 62.

The machine was not a failure, although money was lost in getting it perfected and attempting to work it in the winter, and when good weather came and the machine was perfected it had only about 50,000 cu. yds. of soft material to remove. The scraper could not move gravel or other hard material.

The work of the dredge was to cut a channel through the soft material of the old river bed, under which lay from 6 to 8 ft. of hard glacial drift covering solid rock. The muck channel had, of course, to be pumped dry before the hard glacial drift and rock could be got at, and as it was feared that the sides of the muck channel would slide into the excavation when the water was removed, it was decided to build revetments of hard material to support them. This was done with material taken from the east end of the section, as shown by the track plan, Fig. 63. Tracks were laid along the edges of the muck channel, and the hard material taken along them in cars and dumped. Fig. 64 is a view of the muck channel looking west from the levee, which shows the manner of placing the revetment. It will be understood that after placing this revetment the water was all pumped out and the remaining work was done by dry excavation, and also that the usual retaining walls were built. In other words, the revetment was a temporary support for the muck banks, although, of course, it was never removed.

In constructing the levee between the river diversion and main channels considerable trouble was also had with this muck bed. Owing to the sinking of the hard material into the muck, the levee had to brought up to grade with additional material several different times. To prevent washouts the levee was also riprapped all along the river diversion channel side.

Turning now to the work on the east end of the section, Fig. 63 shows the system of excavation followed. The material was excavated with steam shovels and loaded into dump cars, which were hauled to the spoil banks by teams and incline hoists. Teams took the cars from the shovels to the bottoms of the inclines, where a cable was attached and they were hauled to the top by winding engines. At the top teams were again attached and took the cars to the spoil bank or to the revetment work. In the pit it will be noticed that the switches were extended along the bottom as the work proceeded. The steam shovels used were built by the Vulcan Iron Works Co., of Toledo, O., and were light traction-wheel shovels of the Little Giant type. They were worked in somewhat variable material, but generally the digging was pretty hard, although not comparing with the cemented gravel work on some of the preceding sections. According to the reports of the Superintendent of Construction, two of these shovels worked 35½ 10-hour shifts in December, 1894, and 33 10-hour shifts in January, 1895, and averaged 360 cu. yds. and 444 cu. yds., respectively, for those two months.

The method of excavating the hard glacial drift west of the cross levee after the water had been pumped out is much the same as that adopted for the work east of the levee just described. Steam shovels load into dump cars, which are hauled to the spoil bank by teams and incline hoists. Cableways have been used to some extent for handling glacial drift, the skips being loaded by hand, and have done satisfactory service.

The principal work of the cableways has, however, been in handling rock. Altogether there are four cableways on the section, and, according to a report from the contractors, their output from December, 1894, to March, 1895, inclusive, was as follows:

Month.	No. shifts worked.	L'gth shift, hrs.	Delay for repairs, hrs.	Delay for skips, hrs.	Total cu. yds. excav.	Av. skip-load, cu. yds.
December	82	9	37	138	24,572	1.3
January	99	9	62	197	30,080	1.43
February	70	9	28	102	29,973	1.33
March	92	10	91	140	31,747	1.5

From these records some interesting figures are obtained, showing the average hours of delay per 10 hours of operation:

	Dec., hrs.	Jan., hrs.	Feb., hrs.	Mar., hrs.
Delay for rep'rs per 10 hrs. w'ked.	0.50	0.69	0.44	0.98
" " skips " " " "	1.87	2.21	1.62	1.52
Total delays per 10 hrs. worked.	2.37	2.90	2.06	2.50

These figures show that with cableways operating one 10-hour shift per day, each machine will lose from 30 mins. to 1 hour waiting for repairs and for skips to be loaded. Other records bear out this statement, and, in fact, show it to be too conservative. For example, on Section 7 the average delay per 10-hour shift for one cableway for three months was 1.8 hours, and on Section 8 similar figures for two cableways gave the average delay for each as 1.12 hours. With the machines working two shifts per day the delay per shift will run somewhat higher owing to not having the night hours free to make the heavier repairs.

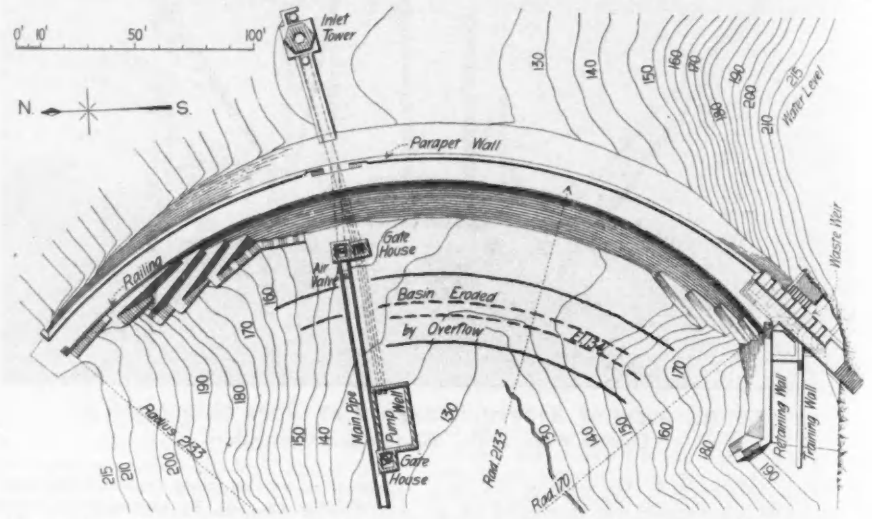


FIG. 1. PLAN OF SWEETWATER DAM, NEAR NATIONAL CITY, CAL., SHOWING BASIN ERODED BY FLOOD.

Reducing all work to 10-hour shifts, the average output per cableway and per laborer—35 being worked to a face—per 10-hour shift were:

	Dec.	Jan.	Feb.	Mar.
Cu. yds. per shift	332.8	337.6	293	345
" " per man per shift	9.5	9.62	8.37	9.86

The records of the Superintendent of Construction give exact figures for only two of the months covered by the records furnished by the contractors, but for these two months considerable discrepancy existed between the two sets of figures. The figures stand as follows:

	December. Official.	December. Contr.'s	January. Official.	January. Contr.'s
No. 10-hr. shifts w'ked.	75	73.8	79.8	89.1
Total cu. yds. excav.	23,700	24,572	29,500	30,080
Cu. yds. per 10-hr. shift.	316	332.8	370	337.6

It will be seen that the principal discrepancy exists between the figures showing the number of shifts worked, and this may have arisen in several ways, owing to the manner of keeping the records. The reliability of the figures as an exact record of work done on Section 6 is affected by this discrepancy, but for a broad generalization of the efficiency of cableway work their usefulness is not injured much. In other words, neither the contractor's nor the engineer's records give outputs differing greatly from the well-known average outputs of cableways all along the channel. Such information as is available, however, leads to the opinion that the contractor's figures of daily output for January are more likely to be correct, and the discrepancy shown is the greater for this month.

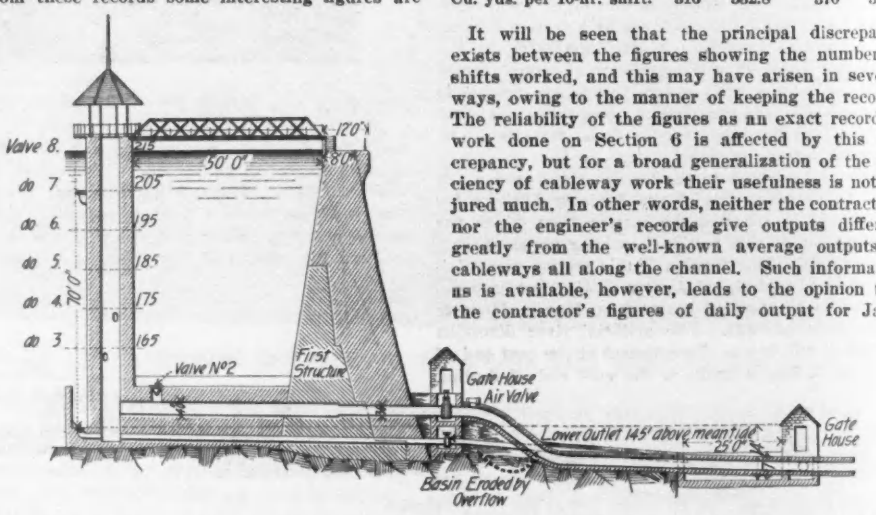


FIG. 2. SECTION THROUGH GATE HOUSE OF SWEETWATER DAM, SHOWING BASIN ERODED BY FLOOD.

For the information from which the description of the work on Section 6 has been prepared, we are indebted to Division Engineer Mr. H. A. Miller and to the contractors, Mason, Hoge & Co.

FLOOD OVERFLOW OF THE SWEETWATER DAM.

By H. N. Savage,* Assoc. M. Am. Soc. C. E.

The rainfall over the Sweetwater drainage area during the second week in January last registered 8¼ ins. at the Sweetwater dam, 5 ins. falling in two consecutive days, with about three times the above quantities falling during the same periods in the higher portions of the watershed. This produced a flood of unprecedented proportions in the

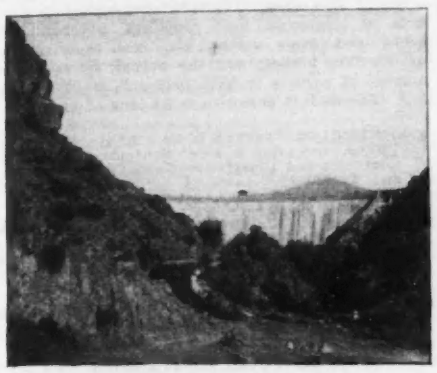


Fig. 3. Sweetwater Dam and 36 in. Pipe Line Before Flood.

valley, causing such a heavy and continuous run-off as to not only fill the 6,000,000,000-gallon reservoir to overflowing in a few hours, but to overtax the combined capacity of the waste-weirs and blow-offs, which were all opened well in advance. For over 40 hours the flood poured over the top of the dam its entire length of 396 ft., forming a cataract 85 ft. in height. The maximum height reached by the water was 22 ins. flow in depth over the parapet wall, and 58 ins. above the top of the dam proper. The dam withstood the shock, however, without the slightest damage in any particular. The sides of the canyon, although ledge rock in place, were badly eroded by the continued bombardment.

The dam is located across a narrow canyon, and is a monolithic structure, being constructed of uncoursed rubble masonry laid in Portland cement, and founded on solid ledge rock throughout, including the ends up to the top, which penetrate this ledge some distance. The waterfall formed a basin in the refuse rock at the base of the dam, which basin, being of course full of water, acted as a cushion. The masonry at the toe of the dam was not exposed to the erosion of the overflow. The plan and section, Figs. 1 and 2, show the basin eroded, and the character of the structure.

The 36-in. pipe line, extending from the dam down through the canyon, although completely encased in the masonry, suffered considerable injury,

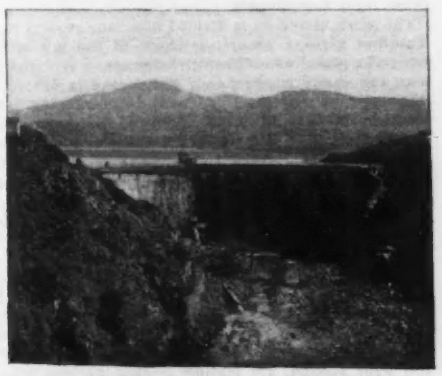


Fig. 4. Sweetwater Dam and Broken 36-in. Pipe Line After Flood.

the second 400 ft. of pipe from the dam being entirely washed out in sections of varying lengths. The pipe line before and after the flood is shown by the views, Figs. 3 and 4, and the dam with the water 9 ins. deep on its crest by the views Fig. 5 and 6.

* Engineer-in-Charge Sweetwater Irrigation System, National City, Cal.

When the dam was constructed in 1887 and 1888 by Mr. Jas. D. Schuyler, M. Am. Soc. C. E., the river channel showed signs of ordinary winter flow to the extent of from 300 to 400 cu. ft. per sec., with some high-water marks in the canyon that indicated a possible extreme flood at times of 1,500 cu. ft. per sec.* The waste-weir was given a capacity equal to these high-water marks, and some excess about 300 cu. ft. per sec. was provided in the blow-offs, but during the winter of 1893 the flow (then considered phenomenal) reached a maximum of 5,500 cu. ft. per sec. for one hour only, which was caused by a local cloud-burst.

The capacity of the waste-weirs, although nominally 1,500 cu. ft. per sec., was virtually 3,000 when the recent flood had carried the water in the reservoir up to the top of the parapet wall and before the dam was overtopped. The waste-weir capacity thus increased became a mere bagatelle, since the flood reached a maximum of 18,150 cu. ft. per sec., or ten times the waste originally provided for, and continued for over 40 consecutive hours before the flood reduced to 5,000 cu. ft. per sec.

The following plans for reconstruction have been developed, contracts let, and construction is now (April 1, 1895) going on. The present waste-weir of seven bays will be increased to 11 in number, and to twice the present height. There will be four blow-off pipes constructed in the tunnel, which runs around the south end of the dam, connecting with the reservoir near the bottom of the dam. Two of these blow-off pipes will be 36 ins. and the other two 30 ins. in diameter, the maximum capacity of the pipes being always available of course, whatever the level of the water in the reservoir. The capacity of these pipes, with the waste-weir enlarged as above, will be sufficient to handle a flood in magnitude equal to or a little greater than the last.

To protect the rocky sides of the canyon at the ends of the dam from erosion by a possibly greater flood, the parapet wall of the dam will be widened at its base, and made 2 ft. higher than at present, the ends being taken back into the sides of the canyon into the solid ledge. An opening will be left in the increased parapet wall, 200 ft. long, 100 ft. either side of the center of the dam, for an emergency waste-weir, over the top of the present parapet.

There will be constructed across the canyon 50 ft. below the toe of the dam a timber crib in the form a grillage, drift-bolted to bedrock. This will form a basin at the foot of the dam, which in time of flood will insure a water cushion above the emergency waste-weir, in case the water ever overtops the dam again. Masonry piers will be constructed from bedrock, underneath the present pipe line near the foot of the dam, with walls extending into the ledge on the canyon side.

The spaces between these walls, together with those in the grillage crib, will be filled with as heavy rock as can be handled conveniently with derricks. At each end of the dam, the sides of the canyon which were eroded by the past flood will be protected by aprons of concrete masonry constructed in the form of terraces.

There will also be built a concrete apron for the waste-way, extending from the waste-weir down to the bottom of the canyon. The blow-off pipes in the tunnel will extend through to the face of this apron, and with it will deflect the water into the center of the canyon. A trench has been excavated for about 600 ft. of the old pipe line, which was washed away or wrecked, all in solid rock, above high-water mark, along the side of the canyon. A "Y" tunnel is being driven to connect the trench for a new 24-in. main pipe line, now under construction (which runs along the south side of the canyon), with the present tunnel. The new 24-in. pipe will take its supply from one of the 30-in. blow-off pipes.

A shaft has been sunk at the south end of the dam to a connection with the tunnel, and through it will be manipulated the gates on the intake elbows of the blow-off pipes. This shaft, and likewise the tunnel, will be lined with concrete masonry. Masonry piers, or wing-walls, will be constructed at frequent intervals through the canyon, on bedrock, from the north side of the canyon diagonally toward its center, and high enough to include that portion of the old 36-in. pipe line that was undermined or damaged, the spaces between these walls being filled with large rock.

The masonry work will be entirely of concrete, with twisted iron rods incorporated therein, to give additional strength. Keating, Leonard & Ransom, of

Fig. 5. North End of Sweetwater Dam with Water Running 9 ins. Over Top of Parapet.

San Francisco, have the contract for the concrete work, at $8.40 per cu. yd. for the tunnel and shaft lining, and at $5.67 per cu. yd. for all other work. These prices include crushing rock, and elevating the concrete from 25 to 100 ft. The cement, large rock and sand are furnished and delivered by the company. Mr. J. S. Nickerson, of San Diego, has the contract for the shaft, "Y" tunnel, and rock excavation at force account, with 10% added for supplying tools.

* See Eng. News, April 7 and Oct. 27, 1888, for illustrated description of the dam.

FALL OF A BUILDING WITH CAST IRON COLUMNS.

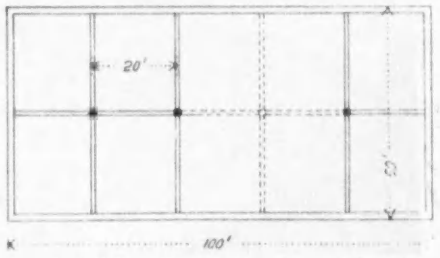
A nearly-finished eight-story building at West Broadway and Third St., New York city, partially collapsed on Aug. 8, killing or mortally wounding 15 persons and injuring several others. The building was 50 × 100 ft. in floor area. The exterior walls were of brick, and the flooring was of the modern fireproof construction, with iron or steel girders and cast iron columns. The framing and tiling of the floors had been completed, and the two upper floors were being plastered. A row of cast iron columns placed along the center line of the building about 20 ft. apart supported the longitudinal beams from which the floor beams extended to the side walls. Two of the five 20-ft. sections thus formed, the third and fourth from the

Fig. 6. South End of Sweetwater Dam and Waste-Weir, with Water Running 9 ins. Over Top of Parapet.

front of the building, together with their common supporting columns in each of the eight stories, fell into the cellar, leaving a clean, open space 40 × 50 ft., the whole height of the building, as indicated in dotted lines in the accompanying sketch. At this writing the cause of the accident is still uncertain, and investigations by the Coroner and by the Department of Buildings are in progress. The

contractor and his foreman have been held to answer to the charge of causing the death of one of the workmen. Three theories have thus far been proposed to account for the disaster; first, the undermining of the foundations of some of the columns by an underground stream; second, flaws in the cast iron columns; third overweighting of some of the floors by bags of plaster. The bags of plaster weighed 152 lbs. each, and if these were piled one above the other, as has been charged, they might have brought an undue load upon a section of the flooring.

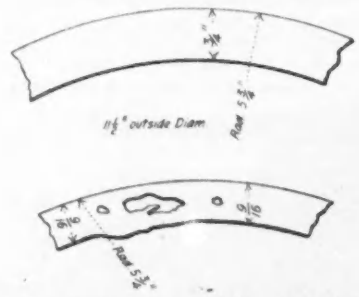
Upon removing the debris after the disaster, the lowermost of the vertical tier of cast iron columns, the one in the cellar, presented a most remarkable



Plan of Building, Showing Location of Cast Iron Columns.

appearance. It originally rested on a block of stone about 12 ins. thick and 4 ft. square, underneath which was a block of concrete of somewhat larger dimensions. The column itself being a hollow, round column, was provided with a square base or flange about 3 ins. thick cast as part of the column. When discovered after removing the debris the column appeared to have been driven directly downwards a distance of about 7 ft., passing entirely through the blocks of stone and concrete, each of which was broken into four large pieces by two cracks at right angles with each other and leaving on the stone the iron base or flange in four pieces. The column had apparently been broken free from its base, almost as if it had sheared its way through, and been pushed through a block of stone 12 ins. thick and a block of concrete 15 ins. thick, and driven 4 ft. further into the earth beneath. The peculiar appearance of the column gave rise to a rumor that a well had been discovered under the stone and concrete foundation, but the rumor was not based on good evidence, for the foundation blocks have not yet been removed, and there is thus far no appearance of any well.

Whatever the actual cause of the accident may have been, one feature in the construction of the building has been revealed on the removal of the debris which itself may be sufficient to account for



Sections of Thick and Thin Sides of Broken Cast Iron Column on Sixth Story, Showing Blowholes on Thin Side.

the collapse of the building, and which should serve as a lesson and a warning to architects and builders of iron structures for all time to come. The column on the sixth floor, which supported the seventh and eighth floors and the roof, was found by a representative of this journal broken square across in the middle. On the exterior surface it appeared to be a perfect casting, but the fractured surface showed it to be about as bad a specimen of a cast iron pipe as could possibly be made without showing flaws on surface inspection. The metal was hard and brittle; the core had shifted, so that the pipe, which was nominally ¾ in. thick, was only 9-16 in. thick on one side and a trifle over ¾ in. thick on the opposite side, and what appeared still worse, the thin side was honeycombed with blowholes and showed "cold shuts" and seams. The sketch given herewith, drawn from an impression taken from the actual fractured surface, shows the relative thickness of the thick and the thin sides of the pipe and the honeycombing on the thin side. Blowholes of about the same size as the large one shown in the cut are found also in other portions of the thin section. After inspection of this fractured column we are enabled to frame the following theory of the cause of the disaster, subject to correction on the discovery of further evidence: The sections of the several floors which fell in contained an elevator shaft, which open space, of course, brought no load on that portion of the collapsed sections. The other portions of the flooring containing beams and tiling weighing approximately 75 lbs. per sq. ft., would bring a heavier load on the side of the column opposite the elevator shaft than on the side towards it. This would cause a somewhat eccentric loading of the column. One of the floors being loaded with plaster in bags, the bags may have been concentrated on one portion of the floor, thus greatly increasing the eccentricity of the loading. The load of the plaster itself, without considering the eccentricity of its position, may have been greater than the breaking load of the column, and, judging from the column itself, it would appear unsafe to carry the weight of the tiled floors alone, which were above it, and of the roof, without the additional load of the plaster bags. If this column on the sixth floor was the first part of the structure which failed, that portion of the seventh and eighth floors and of the roof which it sustained would immediately fall upon the sixth floor, giving a shock to every column in the tier below it and to the foundation. The blow upon the sixth floor would be far more than it could stand, and so in succession each floor down to the first would give way with the increasing momentum of all the superstructure, until the last blow, as the mass of falling material struck the ground floor, would act with the force of a tremendous pile-driver to force the lowermost column through the stone and concrete foundation into the earth below.

The prime cause of the accident appears to us to have been the weakness of the cast iron column. The secondary causes may have been the overloading of the upper floors with plaster in bags, and the concentrating of this loading in such a way that it would bring an eccentric load upon the column.

The moving of a three-story brick building 175 ft. long and 50 ft. wide, a portion of the factory of the Sturtevant Blower Works, at Jamaica Plain, Mass., a distance of 350 ft. has been successfully accomplished. An interesting feature of the removal is the fact that the works were kept in operation during the entire time the building was being moved, except on the lower floor, which, being on the ground, necessitated the removal of all the tools from that floor. An electric motor of 20 HP. was located on the second floor and belted to the main line of shaft. On this floor was erected a reel of wire, one end of which was connected to the generator in the engine room, and the other to the motor. As the building was moved, the reel was unrolled, thus furnishing the additional length of wire needed. The moving was done in the ordinary way, by means of ten capstans and sets of blocks, operated by as many horses.

Three torpedo-boat destroyers, with a guaranteed speed of 36 land-miles per hour, have been ordered by the English Admiralty from the yards of Messrs Thompson, of Glasgow. It is proposed to make these vessels the fastest of their class afloat.

The recent transatlantic voyage of the U. S. cruiser "Columbia" is the subject of an official report by Captain Sumner to the Navy Department, in which he states that the run was made from Southampton to Sandy Hook in 6 d. 23 h. 49 m. The quantity of coal on board at the time of departure was 1,861¼ tons, of which 1,474¼ tons were consumed. Complaint has been made that the present system of arranging coal bunkers prevents the easy supply of the boilers with coal, and thus tends to reduce the speed of the ship. The chief reason why forced draft was not used during the last 24 hours of the trip, as was intended, was the impracticability of getting coal to the boilers with sufficient rapidity to keep up the speed, as the coal was located in distant bunkers at that stage of the run.

BOOK REVIEWS.

EVOLUTION OF THE AIR-BRAKE. By Paul Synnestvedt. New York: "Locomotive Engineering." 8vo; pp. 112; illustrated; $1.

This book opens with a few pages on old lever brakes used for wagons, and then commences its series of power brakes with the Stephenson driving wheel brake of 1833. Steam, vacuum, hydraulic, chain and buffer brakes are all considered, as well as a number of early styles of air-brakes. The book also deals with the details of air-pumps, hose couplings, governors, engineers' and triple valves, etc., and especially with quick-action brakes, and the author states that the number of patents on such brakes is steadily increasing. The book is defective in its lack of an index.

ENGINEERING CONTRACTS AND SPECIFICATIONS, Including a Brief Synopsis of the Law of Contracts and Illustrative Examples of the General and Technical Clauses of Various Kinds of Engineering Specifications. Designed for the Use of Students, Engineers and Contractors. By J. B. Johnson, C. E., Professor of Civil Engineering, Washington University, St. Louis, Mo., M. Inst. C. E., M. Am. Soc. C. E., M. Am. Soc. M. E., etc. New York: Engineering News Pub. Co.; 8vo; cloth; pp. 417; $4.

There is no more important and responsible duty which falls to the lot of a practising engineer than the drawing of important contracts and specifications. It is sometimes argued that this is properly work for the attorney and not the engineer; but the fact is that the production of such a document is a work in which both should co-operate. Unfortunately it is too frequently the case that the attorney who is in charge of this work is ignorant of anything more than the general principles governing contract law, and upon the engineer rests the actual responsibility of foreseeing all future complications and causes of disagreement and so drawing the contract as to meet every such contingency which may in future arise.

It must be confessed that the training of engineers in this important part of their professional work has been in the past too often conspicuous by its absence. The young engineer, when for the first time placed in a position where he becomes responsible for the phraseology of an important contract, generally falls back on the resource of copying some previously used instrument, altering it to suit his special needs. In doing this, however, he naturally perpetuates the errors and faults of the original instrument; and largely in this way it has come to pass that much room for improvement exists in a large proportion of engineering contracts.

The technical schools of this country have for some years recognized the need of instruction in this department, and many of them have been giving instruction in it so far as their crowded curriculums will permit. The lack of a suitable text-book, however, has greatly hampered the teachers of this subject; and Prof. Johnson's work will be gladly welcomed, we have no doubt, by all those interested in engineering education. In fact, the author states in his preface that it was originally prepared especially for use as a text-book in engineering schools; but we believe it will be no less welcome to a great number of engineers and contractors who are desirous of informing themselves as to the general principles which control the form of these legal instruments.

The work before us is divided into four general parts. The first gives a general synopsis of the law of contracts in plain, non-technical language, which the layman can easily comprehend; the second is devoted to "Engineering Specifications and Accompanying Documents"; Part III. discusses technical clauses in specifications, and Part IV., which comprises nearly one-third of the book, is devoted to examples of complete contracts and specifications for various engineering structures. One of these examples is the specification for the steel construction of the Astor Hotel in New York city, prepared by Purdy & Henderson, Consulting Engineers, during the current year.

The specifications given in this book include a great variety of engineering work, and while notably full with respect to civil engineering work, such as masonry, pavements, sewers, iron and steel bridges, etc., contain also specifications for steam plant of an electric light station, for leather belting, turbine wheels, electric light installation, electric wiring, and other mechanical engineering works. Under stand-pipes the author gives the specifications developed by Prof. Pence and published in our issue of Feb. 28, 1895. In general, the author's aim has been to select specifications which shall represent the very latest and best practice at the present time.

Prof. Johnson, in his previous well-known treatises, has done work that is invaluable to the profession. The present work fully sustains the reputation he has gained of writing books that meet the daily needs of the working engineer, and we predict for it a large sphere of usefulness.

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PERSONALS.

Mr. Robert N. Ellis has been appointed Superintendent of the Water-Works of Jacksonville, Fla.

Mr. Charles H. Tompkins, President of the American Diamond Rock Boring Co., died at Somerville, N. J., on Aug. 9.

Mr. Janon Fisher, Assoc. M. Am. Soc. C. E., has been appointed City Commissioner of Baltimore, to succeed Col. Henry T. Douglas, resigned.

Mr. Lynn C. Troutman, a well-known contractor, was drowned while bathing in the Schuylkill River at Shawmont, a suburb of Philadelphia, on Aug. 9.

Mr. W. C. Edes, Chief Locating Engineer of the Southern Pacific Ry., has resigned to accept a similar appointment in the engineering department of the San Francisco & San Joaquin Valley Ry.

Mr. Edmond C. Deane, of Racine, Wis., editor of the Racine "Daily Journal," has been appointed by Gov. Upham as Deep Waterways Commissioner, under a bill recently passed to create this office.

Mr. Munson Nichols, civil engineer, of Troy, N. Y., who has been in charge of a party on the Adirondack survey, has resigned to superintend the construction of the water-works at Middleville, N. Y.

Mr. Mario Menocal, a nephew of Mr. A. G. Menocal, Chief Engineer of the Nicaragua Canal Construction Co., is reported to have been killed in the insurgent service in Cuba. He was about 30 years of age, and was at one time an assistant engineer on the surveys for the Nicaragua Canal.

Gen. Henry L. Abbott, Corps of Engineers, U. S. A., who has been a member of the Board of Fortifications and of the Board of Engineers since 1886, was placed on the retired list on Aug. 13, by reason of age limitation. He was born at Beverly, Mass., Aug. 13, 1831, and graduated at West Point in 1854. His retirement promotes Lieut.-Col. Peter C. Hains, M. Am. Soc. C. E., to be Colonel; Major William Ludlow, M. Am. Soc. C. E., to be Lieutenant-Colonel; Capt. Jos. H. Willard to be Major, First Lieut. Jas. C. Sanford to be Captain, Second Lieut. Chas. Keller to be First Lieutenant, and Additional Second Lieut. Geo. P. Howell to be Second Lieutenant.

ENGINEERING SOCIETIES.

COMING TECHNICAL MEETINGS.

AMER. ASS'N FOR THE ADVANCEMENT OF SCIENCE.
Aug. 28 to Sept. 7. At Springfield, Mass. Secy., F. W. Putnam, Salem, Mass. Local Secy., Wm. A. Webster, Springfield, Mass.

SOCIETY FOR PROMOTION ENGINEERING EDUCATION.
Sept. 2, 3 and 4. At Springfield, Mass. Secy., J. B. Johnson, Washington University, St. Louis, Mo.

NEW ENGLAND WATER-WORKS ASSOCIATION.
Sept. 11 to 13. At Burlington, Vt. Secy., John C. Whitney, Newton, Mass.

NATIONAL IRRIGATION CONGRESS.
Sept. 16 to 19. At Albuquerque, N. Mex. Secy., Fred L. Ailes, Los Angeles, Cal.

AMERICAN SOCIETY OF IRRIGATION ENGINEERS.
Sept. 16 to 19. At Albuquerque, N. Mex. Secy., John S. Titcomb, Denver, Colo.

NEW ENGLAND ROADMASTERS' ASSOCIATION.
Sept. 18, 19. At the Revere House, Boston, Mass. Secy., M. C. Hamilton, Hartford, Conn.

AMERICAN INSTITUTE OF MINING ENGINEERS.
Oct. 8. At Atlanta, Ga. Secy., R. W. Raymond, New York, N. Y.

ROADMASTERS' ASSOCIATION OF AMERICA.
Oct. 8. At St. Louis, Mo. Secy., W. W. Sharpe, Waycross, Ga.

AMERICAN INT. ASSOC. OF BY. SUPTS. OF BRIDGES AND BUILDINGS.
Oct. 15. At New Orleans, La. Secy., S. F. Patterson, Boston & Maine R. R.; Concord, N. H.

AMERICAN STREET RAILWAY ASSOCIATION.
Oct. 15. At Montreal, Que. Secy., John N. Partridge, Brooklyn, N. Y.

NEW PUBLICATIONS.

OHIO STATE BOARD OF HEALTH. Report for the Year Ending Oct. 31, 1894. C. O. Probst, M. D., Secretary, Columbus. 8vo; paper; pp. 347.

The most interesting portions of this report are those reciting the action taken by the Board in regard to projected water and sewerage works, reports on alleged nuisances and on epidemics, and papers on the disposal of night soil at Warren and on the sewage farm at Oberlin. The latter paper is by Mr. W. B. Gerrish, City Engineer. The Oberlin plant was described in Engineering News of June 14, 1894.

REPORT OF THE TWENTY-EIGHTH ANNUAL CONVENTION OF THE AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION. Held at Alexandria Bay, N. Y., 1895. Edited by Angus Sinclair, Secretary, New York. Paper; 8vo; pp. 331; illustrated.

This is the complete report of the proceedings of the annual meeting held in June, 1895, giving in full the several reports and discussions. The proceedings were recorded in our issues of June 20 and 27.

CAPE COD CANAL.—Massachusetts Ship Canal Co., Boston. General Manager, Benjamin J. Berry. Paper; oblong; 8vo; paper; pp. 28, with 15 plates and map.

This publication is issued by the latest company proposing to complete the long-projected canal across Cape Cod, to shorten the route of navigation between Boston and New York and Southern ports by avoiding the course around the cape. The canal is to be 8 miles long, 200 ft. wide, and 23 ft. deep at low water, with no locks, and crossed only by one railway and one highway drawbridge. This company proposes to adopt the Bass River route, and some notes on its project were given in our issue of Aug. 8.

INTERSTATE COMMERCE COMMISSION. Proceedings of a National Convention of Railroad Commissioners Held at the Office of the Interstate Commerce Commission, Washington, D. C., May 14 and 15, 1895. Pub. Doc. Cloth; 8vo; pp. 80.

This publication gives the reports presented and the discussion thereon, the subjects of the reports being the classification of freight revenue, operating expenses, etc., in railway statistics; the regulation of electric railways, the protection of public interests during railway labor contests, the government ownership of railways, and the duties of state railway commissions. There is also a sample of the tabular returns called for by the Ohio State Railroad Commission.

IOWA CIVIL ENGINEERS' AND SURVEYORS' SOCIETY. Proceedings of the Seventh Annual Convention, Held at Dubuque, Ia., Jan. 16 and 17, 1895. Paper; 8vo; pp. 70; illustrated; 50 cts.

In addition to the addresses and the general report of the proceedings, the following papers are given in full, with the discussions: "Tests of Material," C. A. Jameson; "The Technical Requirements of the Successful Engineer," L. Higgins; "Establishing Street Grades in Cities and Towns," Wm. Steyh; "Good Roads," L. H. Stone; "The Glenwood Well," Seth Dean; "Protection of River Banks at Ottumwa, Ia.," C. R. Allen; "Shaft Sinking and Equipment, with Special Reference to Shallow Coal Basins," J. T. Beard.

REPORT OF THE RAILROAD COMMISSIONERS OF THE STATE OF NEW HAMPSHIRE.—Fiftieth Annual Report, 1894. Published by the Commissioners, Concord, N. H. Cloth; 8vo; pp. 255.

In addition to the records of inquiries into accidents, complaints, etc., and the individual returns of steam and street railway companies in tabular form, there is a special report on "railways operated by other than steam power," which is an indication of the spread of the electric railway into fields formerly monopolized by steam railways. The Board was directed by the legislature to report upon general legislation required for the regulation of electric railway companies, and after discussing the evolution and progress of street railways it arrives at the conclusion that a board should pass upon the necessity of each proposed road and the amount to be paid for the use of the highways, that local authorities should prescribe the character of construction and operation, that such roads should be excluded from busy country highways, that grade crossings should be protected, and that fictitious capitalization and the sale of securities at less than par value should be prohibited.

FOURTH REPORT OF THE BUREAU OF MINES, 1894. Printed by order of the Legislative Assembly of Ontario. Pamph.; pp. 261.

In addition to the ordinary dry reading which is to be expected in most official reports, the pamphlet before us contains a considerable amount of matter of more than usual interest. There is a description of the new blast furnace at Hamilton, the first blast furnace which has been built in Ontario since 1854, with a statement of its relative advantages and disadvantages, and of its prospects of life against the competition of iron from the United States and from Nova Scotia. One section of the report, covering 28 pages, is devoted to calcium carbide and acetylene gas. Another section, 20 pages, is entitled "Nickel and Its Uses," and especially describes the properties and uses of nickel-steel. It appears from the report that there was a considerable increase in 1894 in the production of the Sudbury nickel-copper mines, and a reduction in the selling price of nickel at Sudbury from 13.75 to 11.92 cts. per lb. from 1893 to 1894. The report, as a whole, shows that the Canadian mining industry is in a depressed condition, and it complains of the lack of enterprise of Canadian capitalists, who have millions of dollars lying useless in the bank and other millions loaned at very low interest. The capital for the new blast furnace at Hamilton was found in the United States.

TRADE PUBLICATIONS.

LUBRICANTS FOR HEAVY MACHINERY.—The Union Grease Co., Boston, Mass. 8vo.; pamph.; pp. 16; illustrated.

This catalogue describes a number of the different lubricants manufactured by this company for heavy machinery, and especially for locomotives and railway cars, electric railway motors, etc.

STATIONARY ENGINES.—Harrisburg Foundry & Machine Works, Harrisburg, Pa. Paper; 3⅝ × 6⅛ ins.; pp. 16.

This little pamphlet illustrates different types of simple and compound engines for electric light plants, including the Ide and Ideal engines, and also contains newspaper descriptions of the engine room of Keith's Theatre, Boston.

AIR COMPRESSORS.—Clayton Air Compressor Works, New York city. Paper; 11 × 8 ins.; pp. 86; illustrated.

This catalogue opens with an article on "The Widening Use of Compressed Air," showing the application to drills, motors, tools, guns, street cars, pumping, dredging, etc. This is followed by a description of the Clayton compressor and its special parts, with tables of dimensions and prices, and numerous testimonials.

FIREPROOF FLOOR.—Columbian Fireproofing Co., Pittsburg, Pa. Paper; 7½ × 9½ ins.; pp. 34; illustrated.

The Columbian "steel-concrete" system consists of special ribbed bars of steel, which are suspended from the floor beams and supported by steel stirrups, and are embedded in a concrete composed of Portland cement, sand and furnace slag or screenings. Various modifications of this system are shown, and have been used in warehouse and office buildings.

ROCK AND ORE CRUSHING MACHINERY. Earle C. Bacon, New York city. Paper; 7⅞ × 9⅞ ins.; pp. 48; illustrated.

This is an illustrated catalogue and price-list of various patterns of the Farrel and Farrel-Bacon crushers, ranging from small hand machines to large power machines. It also includes screens, bucket elevators, crushing rolls, mortar mills, and diagrams and views of complete crushing and screening plants. Horse-power road rollers, of 2 to 6 tons weight, are also shown.

AUTOMATIC HOISTING AND CONVEYING APPLIANCES.—The Brown Hoisting & Conveying Machine Co., Cleveland, O. Oblong, paper, 10½ × 7 ins.; pp. 45; illustrated.

This is the latest general catalogue of the above-named company, and it illustrates and describes in some detail the large line of hoisting and conveying machines which it manufactures. Perhaps the most noticeable of the various machines illustrated are the large ship-building and coal-handling cranes, and the giant cantilever cranes at work excavating rock on the Chicago drainage canal.

CONSTRUCTION NEWS.

CONDENSED LIST OF CONTRACTS PENDING WITH DATE OF OPENING BIDS.

Bids to be opened.	Work.	Place.	See Eng. News.
Aug. 16.	Plans for school building,	Buffalo, N. Y.	July 18
Aug. 16.	Brick paving,	Cincinnati, O.	July 25
Aug. 16.	Electric light bonds,	Mankato, Minn.	Aug. 1
Aug. 16.	Water bonds ($19,500),	Garrett, Ind.	Aug. 1
	Advertised, Eng. News, Aug. 1 and 8.		
Aug. 16.	Water bonds,	West Carrollton, O.	Aug. 1
Aug. 16.	Portland cement (2,500 bbls.),	Ottawa,	Aug. 8
Aug. 16.	Street signs,	Plainfield, N. J.	Aug. 8
Aug. 16.	Steam road roller,	Plainfield, N. J.	Aug. 8
Aug. 16.	Asphalt paving,	Niagara Falls, N. Y.	Aug. 15
Aug. 16.	Filling (12,000 cu. yds.),	Franklin, N. J.	Aug. 15
Aug. 17.	Asphalt paving,	Indianapolis, Ind.	Aug. 8
Aug. 17.	Canal impvts (9 contracts)	Albany, N. Y.	Aug. 15
Aug. 17.	Sewers,	Taunton, Mass.	Aug. 15
Aug. 17.	Macadamizing,	Norwood, O.	Aug. 15
Aug. 17.	Riprap stone (2,100 tons),	Baltimore	Aug. 15
Aug. 18.	Repairing public building,	Cleveland, O.	Aug. 1
Aug. 18.	Carhouses, etc. (5),	Boston, Mass.	Aug. 15
Aug. 18.	Sewers,	Washington, D. C.	Aug. 15
	Advertised, Eng. News, Aug. 15.		
Aug. 19.	Electric wiring,	Toledo, O.	Aug. 1
Aug. 19.	Brick pav'g (22,000 sq.yds.),	Warren, O.	Aug. 1
Aug. 19.	Steam tug,	New York, N. Y.	Aug. 1
Aug. 19.	Brick paving,	Auburn, N. Y.	Aug. 8
	Advertised, Eng. News, Aug. 8 and 15.		
Aug. 19.	Court house work,	New York, N. Y.	Aug. 8
Aug. 19.	Water imp'v't bonds,	Youngstown, O.	Aug. 8
Aug. 19.	Water-works system,	Osborn, O.	Aug. 8
Aug. 19.	Water-works,	Elizabethtown, Ky.	Aug. 8
Aug. 19.	Electric light plant,	Osborn, O.	Aug. 8
Aug. 19.	Sewers,	New York, N. Y.	Aug. 8
Aug. 19.	Cribwork on Lachine Canal,	Ottawa.	Aug. 8
Aug. 19.	University building,	Cincinnati, O.	Aug. 8

Aug. 19. Asphalt paving, New York, N. Y.....Aug. 15
Aug. 19. Brick paving, Albany, N. Y.....Aug. 15
Aug. 19. Granite paving, Albany, N. Y.....Aug. 15
Aug. 19. Pipe sewers, Albany, N. Y.....Aug. 15
Aug. 19. Sewers, Marysville, Cal.....Aug. 15
Aug. 19. Electric lighting, Milwaukee, Wis.....Aug. 15
Aug. 19. School house, Pittsburg, Pa.....Aug. 15
Aug. 19. Court house work, Brooklyn, N. Y.....Aug. 15
Aug. 19. Bridge, Ridgewood, N. J.....Aug. 15
Aug. 19. Concrete bridge, Hackensack, N. J.....Aug. 15
Aug. 20. Capitol building, Olympia, Wash.....June 20
Aug. 20. Steel highway bridge, Warren, Pa.....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Aug. 20. Sewer system, Logan, O.....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Aug. 20. Paving bonds, Springfield, O.....Aug. 1
Aug. 20. Library building, Kansas City, Mo.....Aug. 1
Aug. 20. Bridge abutments, Lock Haven, Pa.....Aug. 1
Aug. 20. Museum building, Brooklyn, N. Y.....Aug. 1
Aug. 20. Sewer, Mount Vernon, N. Y.....Aug. 1
Aug. 20. Cast iron pipe, Hoboken, N. J.....Aug. 1
Aug. 20. Water-works system, Flushing, Mich..Aug. 8
Aug. 20. School building, Detroit, Mich.....Aug. 8
Aug. 20. Electric light plant, Flushing, Mich...Aug. 8
Aug. 20. Cleaning reservoir, Waterbury, Conn..Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 20. Macadamizing, Winnetka, Ill.....Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 20. Pipe sewer, Brazil, Ind.....Aug. 8
Aug. 20. Brick paving, Indianapolis, Ind.....Aug. 15
Aug. 20. Street improvements, Logansport, Ind..Aug. 15
Aug. 20. Asphalt block paving, Hamilton, O.....Aug. 15
Aug. 20. Belgian block paving, Jersey City, N.J..Aug. 15
Aug. 20. Water-wks system, McMinnville, Tenn..Aug. 15
Aug. 20. Hot water heater, Macon, Ga.....Aug. 15
Aug. 20. Plans for school house, Bayonne, N. J...Aug. 15
Aug. 20. Sewers, Jersey City, N. J.....Aug. 15
Aug. 20. State canal impvts, Albany, N. Y.....Aug. 15
Aug. 20. Pipe, lead, meters, etc., Philadelphia..Aug. 15
Aug. 20. Drains, Philadelphia, Pa.....Aug. 15
Aug. 20. Pipe sewer, Harrison, N. J.....Aug. 15
Aug. 20. Grading, etc., Harrison, N. J.....Aug. 15
Aug. 21. Dredging in Indian River, Fla.....July 25
Advertised, Eng. News, July 25 to Aug. 15.
Aug. 21. Water-works system, Oelwein, Ia.....Aug. 8
Advertised, Eng. News, Aug. 8.
Aug. 21. Asphalt paving, New York, N. Y....Aug. 15
Aug. 21. Brick pvg (22,000 sq.yds.), Warren, O..Aug. 15
Aug. 21. Paving, Middletown, N. Y.....Aug. 15
Aug. 21. Granite block paving, New York, N. Y..Aug. 15
Aug. 21. Water gates, Brooklyn, N. Y.....Aug. 15
Advertised, Eng. News, Aug. 15.
Aug. 21. U. S. court house work, Columbus, Ga.Aug. 15
Aug. 21. Fender system, Tompkinsville, N. Y..Aug. 15
Aug. 21. Sewer, Cleveland, O.....Aug. 15
Aug. 21. Medical bath, New York, N. Y.....Aug. 15
Aug. 22. Water-works system, Lancaster, Wis..Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 22. Electric lighting, St. Thomas, Ont.....Aug. 8
Aug. 22. Water-works at Sonyea, N. Y.....Aug. 8
Advertised, Eng. News, Aug. 15.
Aug. 22. Water-works, St. Johnsville, N. Y.....Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 22. Pipe sewers (27,000 ft.), Avon, N. Y..Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 22. Water-works, St. Johnsville, N. Y.....Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 22. Cement sidewalks, Indianapolis, Ind...Aug. 15
Aug. 22. Asphalt paving, Indianapolis, Ind.....Aug. 15
Aug. 22. Street improvements, Dayton, O.....Aug. 15
Aug. 22. Use sewage and land, Salt Lake City..Aug. 15
Aug. 23. Grading, Des Moines, Ia.....Aug. 15
Aug. 23. U. S. public building at Savannah, Ga.Aug. 8
Aug. 23. Brick paving, Des Moines, Ia.....Aug. 15
Aug. 23. Lay'g water mains (20 sts.), New York..Aug. 15
Aug. 23. Granite block paving, New York.....Aug. 15
Aug. 23. Asphalt paving, New York, N. Y.....Aug. 15
Aug. 23. Sewer, Rochester, N. Y.....Aug. 15
Aug. 23. Brick paving, Rochester, N. Y.....Aug. 15
Aug. 23. Sewers, Chicago, Ill.....Aug. 15
Aug. 24. Water-works materials, Jasper, Ind....Aug. 8
Aug. 24. Plans school bldg., New Whatcom, W'n.Aug. 8
Aug. 24. Water bonds ($23,000), Casper, Wyo..Aug. 15
Aug. 24. Road improvements, Cincinnati, O....Aug. 15
Aug. 24. Water bonds, Warren, Ill.....Aug. 15
Aug. 25. Plans hospital building, Bangor, Me..Aug. 15
Aug. 26. Hospital buildings, Bangor, Me.....July 25
Aug. 26. Electric lighting, Collinwood, O.....Aug. 1
Aug. 26. Brick paving, Michigan City, Ind.....Aug. 15
Aug. 26. Macadamizing, Yonkers, N. Y.....Aug. 15
Aug. 26. Macadamizing, Mount Vernon, N. Y..Aug. 15
Aug. 26. Paving, Syracuse, N. Y.....Aug. 15
Aug. 26. Water bonds ($90,000), Pittsfield, Mass.Aug. 15
Aug. 26. Brick sewer, South Bend, Ind.....Aug. 15
Aug. 27. Supplies for Mare Island navy yard...Aug. 8
Aug. 27. Brick paving, Jersey City, N. J.....Aug. 15
Aug. 27. Granolithic paving, Jersey City, N.J..Aug. 15
Aug. 27. Water-works system, Remsen, Ia.....Aug. 15
Aug. 27. Plumbing, etc., Detroit, Mich.....Aug. 15
Aug. 27. Rebuilding beacon near Elizabethport.Aug. 15
Aug. 27. Pipe sewers, Mechanicsville, N. Y.....Aug. 15
Advertised, Eng. News, Aug. 15.
Aug. 27. Sewer, Port Richmond, N. Y.....Aug. 15
Aug. 27. Steel pipe sewer, Jersey City, N. J...Aug. 15
Aug. 27. Viaduct, Jersey City, N. J.....Aug. 15
Aug. 27. Bridges (2), Stanton, Neb.....Aug. 15
Aug. 27. Pipe sewer, Valparaiso, Ind.....Aug. 15
Aug. 27. Jail, etc., New Kensington, Pa.....Aug. 15
Aug. 27. Heating & ventilating, Detroit, Mich..Aug. 15
Aug. 28. Water-works system, Sigourney, Ia...Aug. 8
Advertised, Eng. News, Aug. 8 and 15.
Aug. 28. Brick paving, Cincinnati, O.....Aug. 15
Aug. 29. Asylum building, Bolivar, Tenn.....Aug. 8
Aug. 29. Road, Troy, O. .....Aug. 15
Aug. 29. Paving, Dayton, O.....Aug. 15
Aug. 29. Water-wks. system, Naples, N. Y.....Aug. 15
Advertised, Eng. News, Aug. 15 and 22.
Aug. 29. Signal tower, Cape Arago, Ore.....Aug. 15
Aug. 30. Timber (60 sq. miles), Ottawa, Ont....July 11
Aug. 30. Plans for school bldg., Buffalo, N. Y..Aug. 1
Aug. 30. Sewers, Elizabeth, N. J.....Aug. 15
Aug. 30. Pipe sewers, Buffalo, N. Y.....Aug. 15
Aug. 31. Grading, Omaha, Neb.....Aug. 15
Sept. 2. Electric light plant, Canton, Miss.....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Sept. 2. Water-works system, Canton, Miss....July 25
Advertised, Eng. News, July 25 and Aug. 1.
Sept. 2. Water-works franchise, Canton, Miss..July 25
Advertised, Eng. News, July 25 and Aug. 1.
Sept. 2. Electric lighting, Hempstead, N. Y...Aug. 8
Advertised, Eng. News, Aug. 8.
Sept. 2. Water-works system, Millersburg, O..Aug. 8
Advertised, Eng. News, Aug. 8 to 22.
Sept. 2. Bridge, Olivet, S. Dak.....Aug. 8
Sept. 2. Court house, Lumpkin, Ga.....Aug. 15
Sept. 2. Water-works system, Columbiana, O..Aug. 15
Sept. 2. Court house work, Columbus, Ga.....Aug. 15
Sept. 2. Heating and ventilating, Cincinnati, O.Aug. 15
Sept. 3. Prison labor to let, Michigan City, Ind.Aug. 1
Sept. 3. Levee work, Greenville, Miss.....Aug. 8
Sept. 3. Water supply, Camden, N. J.....Aug. 15
Advertised, Eng. News, Aug. 15.
Sept. 3. Water-works system, Warren, Ill.....Aug. 15
Advertised, Eng. News, Aug. 15 and 22.
Sept. 4. Electric light plant, Blackwood, N. J...Aug. 15
Sept. 5. State capitol plans, St. Paul, Minn.....July 11
Sept. 6. Court house, South Bend, Ind.....July 25
Sept. 6. Removing shoals (4), Detroit, Mich...Aug. 8
Advertised, Eng. News, Aug. 8 to 29.
Sept. 9. Dredging, Washington, D. C.....Aug. 15
Advertised, Eng. News, Aug. 15 to Sept. 5.
Sept. 10. Plans for city hall, Worcester, Mass...July 18
Sept. 10. Water-wks system, Grand Junction, Colo..Aug. 1
Advertised, Eng. News, July 18 to Aug. 8.
Sept. 10. Laying water pipe, Brooklyn, N. Y...Aug. 15
Advertised, Eng. News, Aug. 15.
Sept. 13. Cement, castings, etc., Washington..Aug. 15
Advertised, Eng. News, Aug. 15 to Sept. 5.
Sept. 13. Plumbing, etc., Philadelphia, Pa.....Aug. 15
Sept. 14. Plans for library bldg., Madison, Wis..July 18
Sept. 17. Water-works franchise, Rushville, Ind.Aug. 15
Advertised, Eng. News, Aug. 8 to 22.
Sept. 18. Water-wks. franchise, Butte, Mont...July 11
Advertised, Eng. News, July 11 to Aug. 8.
Oct. 1. Plans for art building, Philadelphia, Pa..May 23
Advertised, Eng. News, May 23 to June 27.
Oct. 1. Composite gunboats, Washington, D. C.Aug. 1
Nov. 1. Plans school building, Pittsburg, Pa...Aug. 8

RAILWAYS.

East of Chicago.

COAST RY. OF N. S.—A correspondent writes us as follows: Work on this road is now making considerable progress. The grading is completed to Argyle, 22 miles, and will be finished to Pubnico, 35 miles, this year. About 25 miles of rails are now on the way from England, to be delivered at Yarmouth, in August. Contracts were awarded July 1 as follows: Harry Townsend & Co., of New Glasgow, N. S., for the completion of the culverts and bridge masonry on the first 30-mile section (the masonry work on the first 10 miles is now practically completed); Central Bridge & Engineering Co., of Peterborough, Ont., for steel bridges, all to be delivered Oct. 1; Warren Taylor, of Sailsbury,, N. B., for ties, and Strathy & Co., of Montreal, Can., for fencing. It is the intention to build and put in operation this division of the road this year. This road was originally commenced as a 3-ft. gage, but the first of this year an act was passed in the local legislature permitting the company to change to standard gage, and all work, bridges, etc., are now being constructed for standard gage. This company has been menaced for the past 15 months by a syndicate of New York and Boston people, who bought a charter covering part of this ground, which had been granted some time previous to the granting of the Coast railway company's charter, but had expired through lapse of time and non-organization of the company previous to the selling of the same. These people, on discovering their mistake, applied to the Dominion government to revive their old charter. This was objected to by a large number of the members of Parliament on the ground of interference with Provincial rights and menacing a road already under construction, and from the fact that the company applying for it was practically dead, owed over $100,000 to laborers and supplymen and others, and from evidence produced in the House of Parliament, that the individuals applying for the charter proposed to sell out as soon as obtained. On account of this opposition, the bill was passed in such shape that it is inoperative, and no capitalists can be induced to take hold of it. The district through which the Coast railway company's line passes would be well satisfied with one line of railway. Two roads would starve, where one could live. The Coast Railway is being built by the Nova Scotia Development Co., of Philadelphia, of which John A. Brill is president, and Geo. A. Fletcher, treasurer. The officers of the Coast Railway Co. are: Pres., Thomas Robertson; Secy., S. D. Pettit; Ch. Engr., L. H. Wheaton. General offices, Yarmouth, N. S.

GLOVERSVILLE & BROADALBIN.—David H. Lewis, of Tribes Hill, N. Y., has been awarded the contract to complete this road from Broadalbin, N. Y., to a connection with the Fonda, Johnstown & Gloversville at Warren Crossing, 6 miles. The work has heretofore been done by day labor, under the direction of J. W. Cleveland, Ch. Engr. The road is to be completed by Oct. 1.

LIMA NORTHERN.—It is reported that work has been commenced on this railway. It is thought that the Cincinnati Southern is interested, and that the project means a new line between Toledo and Cincinnati. Shops will be built at Lima, O.

PITTSBURG, AKRON & WESTERN.—A press report from Youngstown, O., states that this road is to be extended east through Youngstown to Pittsburg, Pa., and that a double track is to be constructed. Senator Brice recently secured control of the road.

RAQUETTE RIVER.—J. S. Mott & Son, of Saratoga Springs, N. Y., are making surveys for this railway from Tupper Lake to Axton, N. Y. Both preliminary and location surveys are being made, and they may be extended to Long Lake. The road will be an extension of the Northern New York, formerly the Northern Adirondack railway.

WASHINGTON COUNTY.—The voting of Washington county, Me., to subscribe for $500,000 of stock to aid in the construction of this road was noted in our issue of Aug. 1. Geo. P. Wescott and James Mitchell, of Portland, Me., have offered to contract to construct the railway if $200,000 of additional subscriptions are secured, and it is stated that their offer will probably be accepted.

WHEELING & CLEVELAND.—Incorporated in Ohio Aug. 8 to build a railway from Martin's Ferry to Cleveland; capital stock, $200,000; incorporators, J. H. Dempey, L. M. Snyder, C. C. Owes, W. B. Whiting and H. B. McGraw.

Southern.

LA FAYETTE.—Incorporated in Alabama to build the proposed railway from La Fayette to Opelika, noted last week; incorporators, G. E. McGee, W. W. Allen, G. E. Collins, J. W. Tucker, J. C. Griffin, W. B. Wood and others.

LA FOLETTE.—Incorporated in Tennessee to build a railway from La Folette to Jellico, in Campbell county, to connect with the Knoxville & Ohio line to Coal Creek in Anderson county, with extensions which will reach Knoxville; incorporators, Harvey M. La Folette, Evan T. Warner, Sam C. Baird, J. Henderson Reid and E. H. Powers.

MOBILE & OHIO.—H. P. Farrar, Ch. Engr., Jackson, Tenn., is reported as making a new survey of the Montgomery, Tuscaloosa & Memphis road between Tuscaloosa and Montgomery, Ala., with a view to the purchase and completion of the road by this company.

NORTH CAROLINA.—The Southern Ry. Co., which operates this road under a lease, has ordered heavy steel rails to be laid between Greensboro and Selma, a distance of 85 miles. This means that the Southern will enter Norfolk by this route and make that part of the North Carolina road between Selma and Greensboro a part of its main line from Norfolk south to Atlanta.

TENNESSEE CENTRAL.—Press reports state that this road has been purchased by the Louisville & Nashville, and that it will be completed as soon as possible.

Northwest.

MISSISSIPPI VALLEY.—This company is reported to have been incorporated in Illinois Aug 7 to build a railway from East St. Louis to Cairo, part of which road has already been built, while surveys are being made for the remainder; capital stock, $3,000,000; incorporators, T. N. Chase, G. W. Killion, Geo. W. Chase, Chas. A. Gamlin and M. C. Pennell, all of East St. Louis, Ill.

SHAW LUMBER CO.—A press report from Virginia, Minn., states that a railway will be constructed at once from St. James River to Mountain Iron, a distance of about 30 miles. It will be used as a logging road, and it is reported the scheme is being backed by the Shaw Lumber Co., of Cloquet, Minn.

WASHBURN, BAYFIELD & IRON RIVER.—Incorporated in Wisconsin to build a railway from Bayfield to Iron River, 70 miles; capital stock, $1,000,000; incorporators, Isaac H. Wing, R. D. Pike, O. Flanders, W. W. Downs, of Bayfield; F. J. Meehan, Howard Benton, J. A. Jacobs, M. N. Olstad, D. M. Maxcy, John Waegerle, Washburn; Byron Ripley, A. A. Hobbs, Iron River, and W. E. McCord, Chippewa Falls.

Southwest.

DENISON & PACIFIC SUBURBAN.—Press reports from Denison, Tex., state that this company, which proposes to build a branch of the Texas & Pacific from Sherman to Denison, Tex., 8 miles, has effected a permanent organization, and it is proposed to begin the work of construction as soon as the right of way is secured. Surveys have already been made. Pres., L. S. Thorne; Vice-Pres., R. C. Shearman; Secy., R. Fenby; Treas., L. S. Smith.

LITTLE ROCK & MEMPHIS.—E. H. R. Green, of Terrell, Tex., Pres. Texas Midland, has been investigating the condition of this road, and it is thought that he will purchase the line and extend it to Paris, Tex., to which place the Texas Midland extension will be completed by Jan. 1.

MINEOLA & PITTSBURG.—Work is in progress on this road from Mineola to Pittsburg, Tex., and 2½ miles have been graded. The work is being done by the company. Pres., B. F. Read; Ch. Engr., R. H. Bruce, both of Mineola, Tex.

PAN-AMERICAN.—A press report from San Antonio, Tex., states that J. S. Anthony, Pres., has called a meeting of the stockholders for Aug. 22 to take steps for resuming the construction of this railway, which was commenced several years ago at Victoria, Tex. The road is projected from Victoria to Brownsville, Tex., and thence to the city of Mexico.

Rocky Mt. & Pacific.

MONTANA.—This projected railway was quite fully described in our issue of June 13. It is stated that the contract for the transfer of the road to Chicago parties has been cancelled, and that the original projectors will undertake the completion of the line from Helena to Castle, Mont. New contracts for the grading have been let, and work has been commenced. Samuel Ward has transferred his interest in the Montana Southern, partially graded from Whitehall to Dillon, to the projectors of this road, and the two enterprises are now controlled by the same parties. Ch. Engr., A. G. Lombard; Consult. Engr., W. A. Haven; Pres., R. A. Harlow, all of Helena, Mont.

VULTURE & CASTLE CREEK.—Andrew Barry returned to Phoenix, Ariz., Aug. 3 from making surveys for a standard gage railway from Vulture station, on the Santa, Prescott & Phoenix, to the Castle Creek hot springs, 60 miles north of Phoenix. The road will be 21 miles in length, and it is stated that Congressman N. O. Murphy, owner of the springs, is interested.

Foreign.

TEHUANTEPEC NATIONAL.—A press report from the city of Mexico states as follows: The department of communications reports that it has agreed on a basis of contract with F. H. Cheeswright, a member of the London Institute of Civil Engineers, for the entire equipment of the Tehuantepec National Ry. and the construction of terminal works at both the Atlantic and Pacific ends. The capital is ready in London for this work.

VENEZUELA.—Donald Grant, of Faribault, Minn., and Moses Clapp, W. H. Fischer, J. A. Bordman and J. P. Elmer, of St. Paul, Minn., have returned after several months spent in Venezuela, where it is stated that they were offered several contracts by the government, one being for a railway from Puerto Cabello to San Philipe and thence to St. Augustine, a distance of about 325 miles. The road will probably cost $25,000 a mile, and if the offer is accepted the construction will probably be commenced this fall.

STREET AND ELECTRIC RAILWAYS.

FRANKLIN, N. H.—The Franklin Horse R. R. Co. has voted to engage a surveyor to prepare estimates of the cost of constructing an electric railway from Sawyer's block to Franklin station, and it is probable that the road will be constructed in the fall. Pres., W. F. Daniell; Treas., E. H. Sturtevant; Clk., E. G. Leach.

BOSTON, MASS.—The West End St. Ry. Co. has petitioned for permission to put in two engines, four boilers and two dynamos in a building at Hamblen and George Sts. Electrician, P. Winsor; Ch. Engr. of Power Station, C. F. Baker.

BOSTON, MASS.—The Interstate Consolidated St. Ry.

Co. has petitioned the state board of railroad commissioners for permission to issue $250,000 in bonds and $400,000 in stock to purchase the property of the street railway companies of Attleboro, North Attleboro, Wrentham and Sekonk.

STONEHAM, MASS.—The Mystic Valley St. Ry. Co. has been organized to build an electric railway between Stoneham and Arlington by way of Winchester, a distance of about seven miles; capital stock, $65,000; directors, Onslow Gilmore, of Stoneham; William Bassett, of Woburn; A. E. Whitney, and Abraham Coffin, of Winchester.

SUTTON, MASS.—The Blackstone Valley St. Ry. Co., lately organized, as noted in our issue of July 11, has applied for a franchise to build an electric line through Wilkinsonville as part of a projected road from Rockdale to Millbury. F. L. Dean, of Worcester, is the counsel for the company. H. S. Mathews and E. W. Shedd, of Worcester; S. M. Snow, of Providence, R. I., and James H. Ferguson are interested.

ALBANY, N. Y.—John W. Van Valkenburgh, of Albany, is reported as interested in a projected electric road between this city and Schoharie. Ezra Twitchell, Dr. Dominick and A. McHarg, of Schoharie, have been appointed a committee to advance the project.

CLYDE, N. Y.—It is reported that the Niagara Electric Co., of Niagara Falls, has made an offer to the towns of Galen, Rose and Huron that if they will pledge $10,000 the company will build an electric railway to connect these places with Clyde and Bonnicastle, on Sodus Bay, a distance of 12 miles from Clyde.

FAYETTEVILLE, N. Y.—The Syracuse & Suburban R. R. Co. has petitioned for a franchise for an electric railway through this village. Chas. E. Hubbell, John L. King, Platt H. Smith, Giles H. Stillwell, Osgood N. Tracy and others are interested.

FISHKILL, N. Y.—Surveys are being made for an electric railway from this village to Wappinger's Falls. Dr. W. J. Conklin is interested.

HERKIMER, N. Y.—The state railroad commissioners have granted the Utica & Herkimer St. Ry. Co. permission to build an extension to its electric road.

NEW YORK, N. Y.—The mayor has signed the resolution passed by the aldermen granting the People's Traction Co. a franchise for its proposed electric road on about 26 miles of streets in the northern part of the city. Pres., Franklin A. Wilcox.

PATCHOGUE, N. Y.—We are informed that the preliminary arrangements are being made to construct an electric railway from Patchogue, on Great South Bay, by way of Medford, Farmingville, Terryville and other places, to Port Jefferson, on Long Island Sound, a distance of 14 miles, and there to connect with the steamers for Bridgeport, New Haven, etc. The company will have a capital stock of $200,000, and it is proposed to complete the preliminary arrangements at once. E. T. Moore, of Patchogue, and Wilmot M. Smith, County Judge of Suffolk county, are interested, but all communications should be addressed to Joseph B. Swezey, Roe's Block, Patchogue.

PORT CHESTER, N. Y.—The Port Chester, Rye, Harrison & White Plains Electric R. R. Co. has been incorporated with a capital stock of $150,000; directors, John W. Lounsbury, Wm. Ryan, Wm. L. Ward, of Port Chester; John Duffy, of White Plains; Ebenezer Bull, of Harrison, and Charles D. Haines, of Kinderhook.

RHINECLIFF, N. Y.—The Amenia Steam Heating Co. has petitioned for a franchise for an electric railway, electric lights, and water-works. Gen. Man., John R. Thompson.

WHITE PLAINS, N. Y.—The New York, Elmsford & White Plains Ry. Co. has petitioned the state board of railroad commissioners for a franchise for its electric road from Greenburg to Silver Lake Park. Chas. R. De Freest, Secy.

CAPE MAY C. H., N. J.—The Cape May C. H. Light & Power Co. has been incorporated to build an electric railway across the meadows to Stony Harbor. Pres., Alexander R. Springer, of Cape May C. H.; Secy. and Treas., W. W. Hartell, of Philadelphia, Pa.

ELIZABETH, N. J.—The Elizabeth St. Ry. Co. is preparing to change the motive power of its line to electricity. It is reported that the road will be practically rebuilt, at an estimated cost of over $100,000. Supt., J. C. Husbands.

MOUNT HOLLY, N. J.—Press reports state as follows: The Pennsylvania R. R. officials are considering the advisability of using the trolley system from this city to Pemberton, Vincenttown, Medford and to Camden. The new road to Burlington, which was an experimental venture, is said to be highly successful and profitable, and it is said on good authority that in the near future steam will be abandoned on the branch roads. Extra service is to be added from here to Burlington, the traffic now being so heavy that an extra crew is to run between the two points. Information is now being secured concerning the number of bridges, curves, kind of rails used, etc., on these roads, which indicates an early application of the electric system, the data being asked for by the officials in Philadelphia.

ORANGE, N. J.—Press reports state as follows: The Freeman St. Improvement Co., of Orange Valley, has been incorporated to improve the streets and incidentally to build an electric road from the Highland Ave. station of the Morris & Essex R. R., in a straight line, through Freeman St. up the side of the Orange Mountain, with a temporary terminus at St. Cloud. The capital stock of the new company is placed at $100,000, and all the stockholders will be property owners along the line of Freeman St., no other persons to be eligible for membership in the corporation, and the stock to be divided on a pro rata basis, according to the benefit conferred in building the road. Pres., John Davis; Vice-Pres., Franz Berg; Secy. and Treas., Robert D. Colins; directors, Victor N. Savale, Christian H. Heckel, J. Henry Fiedler, and John J. Barry.

HOMESTEAD, PA.—The Homestead & Calhoun Park St. Ry. Co. has been incorporated to build a railway from Homestead to the state road at Calhoun Park, a distance of three miles; capital stock, $18,000; Pres., Matthew H. West, of Homestead; directors, Joseph A. West, Thomas L. Brierly, George Gladden, James B. Neal, Robert M. Elliot, of Homestead.

PITTSBURG, PA.—The residents of Arlington Heights and Lower St. Clair townships are about to petition the Pittsburg & Birmingham Traction Co. or the Duquesne Traction Co. to extend their electric roads through those townships. A. H. Kerr, A. W. Rossiter, J. B. Roesler, Jacob Kriiger and others have been appointed a committee to confer with the officials of the latter road.

BALTIMORE, MD.—Chas. W. Dorsey, of the Manufacturers' National Bank, of Baltimore, J. Carroll Monmonier and William Ferguson have been appointed a committee to secure a charter for an electric railway company with a capital stock of $25,000, to build a road from Wetheredville and Franklinton to connect with the Edmundson Ave., Catonsville & Ellicott City Electric Ry., a distance of 1½ miles. Michael Wallace, of Franklintown; Joseph H. Judick, Pres. People's Bank, Baltimore, and Jacob List are interested. ——It is reported that the contract for the construction of the overhead electric work on the City & Suburban Ry. Co.'s extension to Catonsville, on the Frederick turnpike, has been awarded to Pepper & Register, of Philadelphia. Iron side-poles will be put up as far out as Loudon Park, and wooden poles from there to the terminus, west of Catonsville. Work will be begun at once.

BALTIMORE, MD.—Press reports state as follows: The contract for building the Columbia & Maryland Electric Ry., which will connect Baltimore and Washington, has been awarded to E. D. Smith & Son, of Philadelphia. The cost of construction will be $3,000,000, and it will be completed within a year. The railway will be double-track throughout, and 80-lb. rails will be used. A contract for a second electric road between Washington and Baltimore is expected to be signed Aug. 8, in New York. The enterprise is backed by the Washington, Sandy Spring & Baltimore Electric R. R. Co. Allston Gerry and Nathan G. Miller, of New York, and James B. Colegrove and George B. Chase, of Washington, will take $750,000 in bonds. This company has a capital stock of $1,500,000. The Sandy Springs route will develop a section not at present reached by railways. The Columbia & Maryland line, on the other hand, has been surveyed with a view to running express trains between the two cities over the shortest possible route, in competition with the Pennsylvania and Baltimore & Ohio railways. The contract for the overhead work for the Columbia & Maryland line has not yet been awarded, as a decision is yet to be reached as to the type of electrical equipment. Ch. Engr., Henry T. Douglas, of Baltimore; John Hubner, of Baltimore, and James B. Colegrove and Geo. S. Chase, of Washington, are interested.——Alfred Mason has completed plans for the new power house of the Baltimore, Middle River & Sparrows Point R. R. Co., to be erected at Fairy Grove. The building will be of brick and iron, 62 × 105 ft., and will contain the machinery to supply power for the company's entire system. It is intended to have the building completed in a short time. The company will also build an iron trestle, 711 ft. in length, across the Philadelphia, Wilmington & Baltimore tracks, near Highlandtown.

JACKSONVILLE, FLA.—Press reports state that an electric railway from Jacksonville to St. Augustine will be in operation by Jan. 1, 1896. The road will be constructed by the Jacksonville & Tampa Bay Improved Ry. Co. This company was chartered to construct and operate a line from Jacksonville to some point on Tampa Bay, with branches running to several important interior towns of the state. The company was promised a grant of 7,000 acres of land per mile for every mile actually built. The promotors have been looking over the ground and have secured the passage of an ordinance by the council of St. Augustine, giving them the right to construct and operate an electric road through the streets of that city. Pres., Crosby Thompson, of Cleveland, O.; Vice-Pres., Edward M. Hammond, of Orlando, Fla.; Gen. Man. and Secy., T. J. Appleyard, of Sanford, Fla.; Treas., O. C. Ringle, of Cleveland, O.; Land Comr., Geo. H. Peckwood, Sr., of Maitland, Fla.

CINCINNATI, O.—Eastern capitalists are reported as interested in a projected electric railway on the Colerain pike to Mount Airy, Groesbeck, Bevis and Venice, with the terminus in the center of this city. J. H. Charles Smith is representing the capitalists.

COLUMBIANA, O.—Press reports state as follows: The project for a steam railway across Columbiana and Mahoning counties, from north to south, with termini at Youngstown and East Liverpool, will now probably be permanently abandoned, as a result of the action of the Youngstown Park & Falls Electric Ry. Co., which has let the contract to Simon Harrold, of Beaver Falls, Pa., for the construction of its railway, 12 miles in length, from Youngstown to North Lima, four miles north of this city; the grading has already commenced. It is understood that the line will be extended to Columbiana to connect with the Pittsburg, Fort Wayne & Chicago R. R., as soon as right of way is granted by the Columbiana county commissioners. It will then, no doubt, be extended on through to the Ohio River, at East Liverpool, 21 miles further, at no distant day.

ELYRIA, O.—Parks Foster and others, of Elyria, are interested in a projected electric road between Lorain and this city.

KOKOMO, IND.—The Kokomo & Greentown St. Ry. Co. has been incorporated with a capital stock of $50,000; directors, F. E. Snow, W. E. Avary, C. H. Hilton, J. S. MacDonald, of Detroit, Mich., and F. H. Allen, of Kokomo.

MARION, IND.— It is reported that R. A. Page and C. H. Grant, of Chicago, are interested in a projected electric road from this city to Chicago. The exact eastern terminus has not as yet been decided on, but will probably be the gas belt. These men are looking after the right of way from here to Logansport, which part will be built first. A part of the route to Chicago, they claim, has been secured, and the right of way through Grant county is assured.

RICHMOND, IND.—It is stated that a number of citizens of Richmond are interested in a scheme to build an electric line from this city to Liberty to connect with the Cincinnati, Hamilton & Dayton R. R. Several attempts to establish other lines in Richmond have failed. The Evansville & Richmond did not get any farther than Seymour, and the scheme of the Big Four to build there was soon headed off. The contemplated electric road will cost about $700,000. It will connect Liberty, College Corner and Connersville with Richmond, and give Richmond an outlet that it has long been seeking. It is said that Eastern capitalists will be heavy investors.

DANVILLE, ILL.—The Danville & Northwestern Electric Ry. Co. has been incorporated to build a railway from Danville through Potomac, Rankin and Gillman, and with branches to Paxton, Fairmount, Sidell and Georgetown; capital stock, $100,000; directors, Wm. T. Cunningham, Wm. P. Chandler and W. S. Mathias, of Danville; W. W. Hatch, of New York, N. Y., and J. K. Butz, of Potomac, Ill.

PEORIA, ILL.—Samuel T. White, Pres. Penn Bridge Co., Beaver Falls, Pa., and John B. Hoefger, of Brooklyn, N. Y., are reported as having been making estimates for a projected electric railway between Peoria and Pekin, surveys for which were made by Leander King, ex-county surveyor. A. E. De Mann, E. J. Darst and W. H. Patterson, of Bloomington, Ill., are interested.

MILWAUKEE, WIS.—The Milwaukee St. Ry. Co. has been granted a franchise for its electric road to the towns of Lake and Cudahy. Receiver, H. C. Payne; Gen. Man., C. D. Wyman.

LEBANON, MO.—It is reported that R. S. Scott and Hamilton Scott, of Des Moines, Ia., are interested in a projected electric railway from this city to Gunter Lake, Camden county, and Bagnell, Miller county, to connect with the Missouri Pacific R. R. Col. Kellogg, owner of Gunter Lake, is also interested.

TEHUACANA, TEX.—Chas. R. Pengilly and others are interested in a proposed electric railway between this place and Mexia.

DENVER, COLO.—The mayor has signed the Market St. and Bell Ave. franchises of the Citizens' Ry. Co. The Market St. line commences at 20th and Lawrence Sts., thence on Lawrence to 21st, thence to Market, thence to 38th St., thence across the Platte River to Globeville. The Bell Ave. line commences at 15th and Central Sts., thence on Central to 19th St. and Bell Ave., thence on Bell Ave. to Prospect Ave., thence to Argo St., thence on Argo St. to the city limits. The above lines cover about 4½ miles of street. Work will commence at once upon the Market St. line, and within 90 days upon the Bell Ave. line. Overhead trolley system will be used. Pres., Milo Smith; Ch. Engr., John A. Reeler, both of Denver.

SEATTLE, WASH.—The Seattle & Rainier Beach Ry. Co. has been incorporated to operate the Rainier Ave. electric road, which will be improved; capital stock, $20,000; incorporators, Herman Chapin, E. W. Andrews and Josiah Collins.

BERKELEY, CAL.—The Oakland Consolidated Ry. Co. has petitioned for permission to extend its electric line to North Berkeley, and W. E. Sell, Pres. Berkeley Electric Lighting Co., and Theodore Wagner, of Berkeley, have petitioned for a franchise for a railway to West Berkeley.

OAKLAND, CAL.—Gen. J. A. Williamson, of Washington, D. C., who is one of the owners of the Moraga grant in Contra Costa county, is reported as considering the question of constructing an electric railway from Oakland across the hills to the Moraga grant lands.

SANTA CRUZ, CAL.—It is stated that a bicycle electric railway on the L. C. Pressly system is to be built to connect this city and Capitola. Ch. Engr., D. E. Condon, of San Francisco. The incorporation of

ELECTRIC LIGHT AND POWER.

CHAMBERSBURG, PA.—The council has decided to purchase an additional 1,000 incandescent light dynamo.

BLACKWOOD, N. J.—Bids are asked until Sept. 4 for furnishing an electric light plant for the Camden county asylum and almshouse. Electrical Engrs., Barnard & Hoopes, 916 Arch St., Philadelphia; Samuel Wood, Chn. Asylum Com.; Herbert W. Johnson, Chn. Almshouse Com.

VERSAILLES, KY.—The mayor will probably soon ask for bids again for putting in an electric light plant, according to reports.

AHNAPEE, WIS.—It is reported that the electric light plant at this place, which was destroyed by fire at a loss of $15,000, will probably be rebuilt. Joseph Wodsedalek is interested.

MILWAUKEE, WIS.—Bids are asked until Aug. 19 for lighting the streets with electricity for one to ten years from Dec. 15. Wm. F. Fredantz, Comptroller.

ROCKPORT, TEX.—It is stated that the Rockport Light & Power Co. will soon ask for bids for constructing an electric light plant to supply 1,500 consumers and to light four miles of streets.

NEW COMPANIES.—The East Orange Electric Co., East Orange, N. J.; $150,000, with $1,000 paid in; Roderick M. Sanger, Chas. C. Jacobus, Alfred Lindsay, Montgomery Lindsay, of East Orange; Wm. E. Runkle, of Newark, N. J.

Consolidated Gas, Electric Light, Heat & Power Co., Newburg, N. Y.; J. B. Odell, James B. Lawson.

New Bethlehem Electric Co., New Bethlehem, Pa.; $1,000; Treas., John B. Thompson, New Bethlehem.

Central Light & Power Co., Montreal, Que.; $50,000; Richard White, Edward H. Barker, Frank E. Kane.

Seattle & Snoqualmie Power Co., Seattle, Wash.; $1,000,000; William McCord, Henry G. Plummer, Lawrence L. Moore.

Connersville Electric Light Co., Connersville, Ind.; $15,000; E. W. Ansted, William Newkirk, J. B. McFarland, J. M. Herron.

Attica Power Co., Attica, Ind.; $10,000; C. J. Haller, T. R. Zeigler, J. A. Wilson, L. M. Green, C. F. Robinson, E. B. Hughes, J. E. Dick.

Northern Electrical Mfg. Co., Madison, Wis.; $50,000; to deal in motors, generators and dynamos; D. C. Jackson, Wm. F. Vilas, A. O. Fox, Conrad M. Conradson.

National Electric Plumbing Supply Co., Cleveland, O.; $25,000; to manufacture sanitary goods, electrical machinery; Wm. T. O'Mara, Wm. H. Cleveland, Wm. J. Gleason, Geo. S. Papworth, M. J. Kelley.

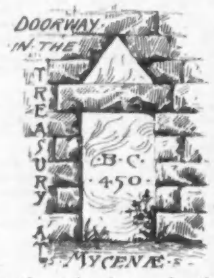
International Electric Co., St. Louis, Mo.; $15,000, with full amount paid in; to manufacture incandescent lamps and other electrical appliances; J. M. Davey, Geo. S. De Lisle, H. G. Ferguson, H. B. Russell.

Ouachita Power Co., Hot Springs or Little Rock, Ark.; $200,000; to supply electricity, etc., and to improve lands in Garland county and construct hotels, etc., thereon; Pres., J. C. Hunsicker, Reading, Pa.; Secy., J. J. Walker, Hot Springs; Treas., R. Murray, Hot Springs.

Kaweah Irrigation & Power Co., Visalia, Cal.; $300,000; to develop the water power of the Keweah River by the construction of a ditch 25 ft. wide and 6 ft.

deep, which, with an electric plant and a turbine wheel, will supply 3,000 HP.; Elisha C. Ward, Chicago, Ill.; A. G. Wishon, Tulare, Cal.; George Hanna and John A. Pirtle, of Los Angeles; O. C. Ainsworth, Pasadena.

BUILDINGS.



BANGOR, ME.—Plans are asked by the commissioners of the Eastern Maine Insane Hospital until Aug. 25 for buildings on the hospital lot in Bangor. Albion Little, Chn. First National Bank Bldg., Portland, Me.

CONCORD, N. H.—The president and the general manager of the Boston & Maine R. R. Co. have decided to recommend to the directors the filling of the large area of land between the present Concord & Montreal shops and the tracks on the intervals east thereof, the raising up and enlarging of the blacksmith shop and boiler house, and to prepare for the location and erection of new passenger car shops east of the train sheds in the rear of the present Concord & Montreal paint shops in this city. The general manager has been directed to prepare plans for the proposed improvements.

BOSTON, MASS.—Bids are asked by the West End St. Ry. Co. until Aug. 19 for erecting four brick car houses and one brick emergency station. Master Mechanic, C. F. Baker; Pres., Samuel Little.——It is reported that the repair shops of the Boston, Revere Beach & Lynn R. R. at Orient Heights have been burned; loss, $50,000.

BROOKLYN, N. Y.—Bids are asked until Aug. 19 for making alterations to the Kings county court house. Thos. F. Farrell, Clk. Com. Bd. Supervisors.

BUFFALO, N. Y.—The New York Central & Hudson River R. R. Co. has completed plans for a new freight station on Michigan St., work on which will soon be begun. Division Engr., E. F. Van Hoesen, Buffalo; Ch. Engr., Walter Katte, New York.

NEW YORK, N. Y.—The board of managers of the New York Metal Exchange has decided to purchase the corner lot at 230 Pearl St., adjoining the present site of the exchange, on which it is proposed to erect a 10-story building.——Bids are asked by the board of charities and correction, 66 Third Ave., until Aug. 21 for constructing a medical bath at Bellevue Hospital. Pres., Henry H. Porter.——Plans have been filed by Stephen Upson, of Athens, Ga., for a seven-story brick apartment house at 112th St. and Fifth Ave., to cost $100,000.

BAYONNE, N. J.—Plans are asked by the board of education until Aug. 20 for a school building to cost not more than $30,000.

ELIZABETHPORT, N. J.—Bids are asked until Aug. 27 for rebuilding the Corner Stake Beacon on the edge of channel in the Kill Von Kull, opposite Elizabethport. Lieut. Wm. E. Craighill, U. S. Engr., Tompkinsville, N. Y.

HOBOKEN, N. J.—Plans have been prepared for a new free public library building at Fifth St. and Park Ave., estimated to cost about $76,000.

NEWARK, N. J.—It is reported that five architects have submitted to a special committee of the board of trade plans for a first-class hotel in Newark, the board of trade having recently taken up the project and invited subscriptions. Three hotel men in New York have offered to conduct the proposed hotel. The cost of the building will be about $500,000.

NEW KENSINGTON, PA.—Bids are asked until Aug. 27 for erecting a fire engine house, jail, etc. F. J. Osterling, Telephone Bldg., Pittsburg; L. S. Strasser, Secy. Council, New Kensington.

PHILADELPHIA, PA.—Bids are asked until Sept. 13 for constructing a three-story brick addition to building No. 3 at the Schuylkill Arsenal, and for the plumbing required for this addition and building No. 4. Maj. Chas. W. Williams, Q. M., U. S. Army.

PHILADELPHIA, PA.—Local papers state that four astronomical buildings, with an observatory, are to be built on West Chester pike for the University of Pennsylvania, at a cost of $50,000. Work has been started on the excavations for the first of the buildings. The observatory tower will be of stone and brick, surmounted by a huge metal-covered dome, and it will be erected on high ground, about 200 ft. from the road. A house for the professor and other buildings are also to be erected, all to be completed by next January.

PITTSBURG, PA.—Bids are asked until Aug. 19 for erecting a new school house in ward 27. Wm. E. Sankey, Pres. Bd. Education, 21st and Carson Sts.

PITTSBURG, PA.—The following bids were received Aug. 9 for erecting the new building for the department of public safety: G. A. Cochrane, $207,000; F. Benze, $203,000; J. H. Trimble & Bro., $198,446; A. & S. Wilson, $197,875; W. Miller & Sons, $195,000; Wm. Kerr's Sons, $193,589; Murphy & Hamilton, $190,000; H. E. Steffler, $189,471; Kerr & Fox, $185,162; C. A. Balph (awarded contract), $180,400.——U. J. L. Peoples has been directed to prepare plans for a 10 or 12-room school house at Bogges Ave. and Wyoming St., estimated to cost $20,000.

WASHINGTON, D. C.—Plans have been approved by the district commissioners, and the Washington & Georgetown R. R. Co. has asked for bids for constructing a union station at 36th and M Sts. in West Washington. The building will be 242 × 180 ft., with a front elevation of 60 ft. and a brick tower 125 ft. high. The foundations were excavated some time ago, but for different causes the work of construction has been delayed. Arch., Waddy B. Wood.

AUGUSTA, GA.—It is reported that plans are soon to be asked for constructing a railway station, to include a trainshed 375 × 50 ft. Address James U. Jackson.

COLUMBUS, GA.—Bids are asked until Aug. 21 for putting in the postoffice building a ventilating and heating apparatus. Wm. M. Aiken, Supervising Arch., Washington, D. C.——Bids are asked until Sept. 2 for remodeling and rebuilding the court house. Archs., A. J. Bryan & Co., Atlanta; Joseph F. Pau, Ordinary; Geo. O. Berry, Secy. Com.

LUMPKIN, GA.—Bids are asked until Sept. 2 for erecting a new court house. Archs., Andrew J. Bryan & Co., Atlanta, Ga.; A. H. Simpson, Chn. Bd. County Supervisors.

MACON, GA.—Bids are asked until Aug. 20 for fitting the court house with a hot water heater. W. G. Smith, Clk. Comrs. Bibb County.

PADUCAH, KY.—It is reported that the Paducah, Tennessee & Alabama R. R. Co. will begin work Sept. 1 on the building of new machine, car, and paint shops and a number of other buildings.

CINCINNATI, O.—Bids are asked until Sept. 2 for furnishing a ventilating and heating apparatus for a 24-room school house at Elm and Adams Sts. J. E. Cormany, Chn. Com. Bd. Education.

LIMA, O.—It is stated that the Lima Northern R. R. Co. has purchased 60 acres of land at the edge of Lima, upon which will be built the company's shops, etc., when the road is completed. The company has completed the survey for its line extending northward from the terminus of the Ohio Southern road, and it is expected that the grading will be commenced at once.

DETROIT, MICH.—Bids are asked until Aug. 27 for the plumbing and gas piping for the United States court house, postoffice, etc., in this city. Wm. M. Aiken, Supervising Arch., Washington, D. C.

DETROIT, MICH.—Bids are asked until Aug. 27 for furnishing a heating and ventilating apparatus for an eight-room school building. Archs., Malcomson & Higginbotham, Moffat Bldg.; L. H. Chamberlin, Secy. Bd. Education.

CHICAGO, ILL.—A building permit has been granted to Leander J. McCormick for a seven-story brick addition to a building at Maderson and La Salle Sts., to cost $128,000.

LEAVENWORTH, KAN.—It is reported that Col. J. W. French, ex-Warden of the Michigan City Penitentiary, recently appointed warden of the new Federal penitentiary at this point, finds the old military prison at Fort Leavenworth unsuitable for the purpose, and Congress will probably be asked to make an appropriation of from $400,000 to $500,000 for the erection of a model institution.

DALLAS, TEX.—Bids are asked for erecting a three-story stone masonic temple, estimated to cost $150,000. A. V. Lane, Chn. Com.

PORTLAND, ORE.—Bids are asked until Aug. 29 for constructing a fog signal building, tower, etc., at Cape Arago Light station, Ore. Maj. James C. Post, U. S. Engr., Portland, Ore.

BRIDGES.

BELFAST, ME.—Plans have been submitted by E. J. Morison for a 1,300-ft. bridge over Belfast Harbor, estimated to cost $85,000. About 1,190 ft. of the bridge will be of iron, and there will be spans of 130 ft. each resting on granite piers. The roadway will be 28 ft. wide and the sidewalk 6 ft. The mayor has suggested that a petition signed by at least 20 prominent citizens be presented to the city government calling a special election of the citizens to decide whether or not a first-class bridge, costing not above $85,000, is desired.

LEBANON, N. H.—The Berlin Iron Bridge Co. has been awarded the contract, at $24,548, for building a three-span iron bridge, 380 ft. long, over the Connecticut River, from West Lebanon, N. H., to White River Junction, Vt. There were 13 bids received, ranging from $24,548 to $32,500.

BOSTON, MASS.—The Boston transit commission has voted to locate the new Charlestown drawbridge a short distance west of the present Charles River bridge, one terminal being in City Square, Charlestown, and the other on Causeway St., opposite Charlestown St. The bridge will be 20 ft. above high water, and will be 100 ft. in width. The plans were prepared by William Jackson, Cy. Engr.

COHOES, N. Y.—The Troy City Ry. Co. has received bids for constructing a new steel bridge 81 ft. in length over the Champlain Canal, near Dotters lock. Gen. Man., C. Cleminshaw, Troy.

NEW YORK, N. Y.—A public hearing will be held Aug. 26 in the matter of location and grades of approach for the bridge proposed to be built across the Hudson River at 69th St. by the N. Y. & N. J. Bridge Co., as stated in our advertising columns. Col. Henry L. Abbot, U. S. Engr. Office.

BRIDGETON, N. J.—The Cumberland county freeholders have decided to build a new $10,000 bridge over the Cohansey River at Bridgeton, the South Jersey Traction Co. agreeing to pay one-third the cost for the privilege of running a track over the bridge.

HACKENSACK, N. J.—Bids are asked by the board of freeholders until Aug. 19 for building a concrete bridge over the Saddle River at Dunkerhook, Bergen county. Address J. L. Van Buskirk, 115 Main St., Hackensack.

JERSEY CITY, N. J.—Bids are asked until Aug. 27 for building a viaduct on 13th St., from Coles St., in lower Jersey City, to the easterly end of Hoboken Ave. The estimated quantities are as follows: About 360 piles, 22,500 ft. B. M. of yellow pine, 9,000 lbs. of bolts and spikes, 550 cu. yds. masonry, 1,362 lin. ft. of viaduct, etc. John C. Kaiser, Chn. Com.

PATERSON, N. J.—The board of freeholders received the following bids Aug. 5 for building a new iron bridge of three spans of 96 ft. each over the Passaic River at Fifth Ave.; Arthur W. Bishop, Chn.: Mason work, A. Wentink, $5,895; Robert Downey, $5,500; Richard Stanley, $4,300. Superstructure, Havana Bridge Co., Havana, N. Y., $12,765; Toledo Bridge Co., Toledo, O., $12,000; Groton Bridge & Mfg. Co., Groton, N. Y., $11,995; Horseheads Bridge Co., Horseheads, N. Y., $11,790; Passaic Rolling Mill Co., $11,777; Penn Bridge Co., $11,700; Massillon Bridge Co., Massillon, O., $11,400; Wrought Iron Bridge Co., Canton, O., $11,100; Berlin Iron Bridge Co., $10,900; Owego Bridge Co., Owego, N. Y., $10,372.

RIDGEWOOD, N. J.—Bids are asked by the committee of the board of freeholders until Aug. 19 for constructing a steel and concrete bridge over the Saddle River at Linwood Ave. Address T. V. Terhune, Ridgewood.

DOYLESTOWN, PA.—The county commissioners received the following bids Aug. 5 for constructing the substructures for three bridges; contract awarded to Nelson & Buchanan, Chambersburg, Pa.:

	Ku'p's.	Funk's.	Trauger's.
Groton Bridge Co.	$2,000	$2,300	$6,000
Dean & Westbrook	2,410	2,550	6,200
Pittsburg Bridge Co.	1,900	2,250	7,000
Berlin Iron Bridge Co.	2,363	2,900	6,271
King Bridge Co.	2,400	2,596	6,200
Toledo Bridge Co.	2,100	2,400	7,265
J. A. Lyte	2,219	2,576	6,175
Horseheads Bridge Co.	2,163	2,495	6,225
Nelson & Buchanan	1,890	2,240	5,900

HAMBURG, PA.—Wm. J. Hollenbach, George H. Miller, J. B. Mengal and others, of Tilden, and Henry Engel, John Sunday and Benjamin Graber, of Perry, have petitioned the county commissioners to build a bridge over the Schuylkill River at Berne station, between Tilden and Perry townships. The viewers about two years ago recommended the construction of an iron bridge 300 ft. long at this place, at an estimated cost of $12,000 to $15,000.

BALTIMORE, MD.—It is reported that the Baltimore, Middle River & Sparrows Point R. R. Co. is about to build an iron trestle 711 ft. in length over the Philadelphia, Wilmington & Baltimore R. R. tracks near Highlandtown.

PARKERSBURG, W. VA.—A meeting of the Little Kanawha Bridge Co., recently incorporated, will be held Aug. 29 to consider plans for constructing a toll bridge over the Kanawha River at Fifth St., at an estimated cost of $8,000. The structure will have a walk 6 ft. wide, and it will be of the suspension type. It is thought that the contract will be awarded soon, but that the bridge will not be built till next year. William Bentley, William Kirk, J. Henry Fischer and others are interested.

RALEIGH, N. C.—The Southern Ry. Co. having ordered heavy new rails to replace the light ones on the North Carolina road, between Selma and Greensboro, N. C., a distance of 85 miles, with a view to using that line for heavy freight traffic, etc., the numerous bridges over Haw River and other streams between these points will be strengthened, and in some cases replaced by stronger structures.

STATESVILLE, N. C.—Geo. H. Brown and associates of Statesville, N. C., will build an iron bridge across the Catawba River at that point.

VICKSBURG, MISS.—The following bids were received by the board of supervisors Aug. 5 for constructing a steel bridge over Big Bayou:

J. H. Whitner, Knoxville, Tenn.	$3,000
Toledo Bridge Co., Toledo, O.	2,874
Brackett Bridge Co., Cincinnati, O.	2,870
J. M. Searles, Vicksburg, Miss.	2,634
W. H. McNeal, Raymond, Miss.	2,500
W. S. Payne, Montgomery, Ala.	3,150
Youngstown Bridge Co., Youngstown, O.	4,075
Penn Bridge Co., Beaver Falls, Pa.	3,495
Iron Substructure Co., Columbus, O.	2,868
Gillette-Herzog Mfg. Co., Minneapolis, Minn.	2,790
J. J. Mulligan, Vicksburg, Miss.	2,960

The board voted to build a wooden bridge, and awarded the contract to J. M. Searles, of Vicksburg, at $858. It is probable that it will award contract for iron bridge at the next meeting in September.

CLEVELAND, O.—About 60 ft. of the South Brooklyn approach to the new Brooklyn bridge in Cuyahoga county, was washed away Aug. 3. The bridge was built about two years ago by Elijah Doolittle & Son. Repairs will be made at once to the damaged structure.

IRONTON, O.—It is stated that the following bids were received by J. R. C. Brown, Cy. Engr., Aug. 1 for building an iron bridge over Storm Creek at Elm St.:

Bellefontaine Iron Works, Bellefontaine, O.	$5,775
Variety Iron Works, Cleveland, O.	8,000
Massillon Bridge Co., Massillon, O.	$8,760 and 9,520
Lafayette Bridge Co., Lafayette, Ind.	5,000
Brackett Bridge Co., Cincinnati, O.	*$4,600 to *5,800
Iron Substructure Co., Columbus, O.	$5,900 to 7,100
Wrought Iron Bridge Co., Canton, O.	$5,330 to 8,000
Indiana Bridge Co., Muncie, Ind.	$5,300 and 6,100
Toledo Bridge Co., Toledo, O.	7,225
King Iron Bridge Co., Cleveland, O.	5,047
Groton Bridge & Mfg. Co., Groton, N. Y.	6,700
New Columbus Bridge Co., Columbus, O.	$5,300 to 6,935

* Add $427.60 for steel joists.

SPRINGFIELD, O.—A two-span bridge over the river on the Ohio Southern R. R., at Paint River was wrecked Aug. 11 by both spans giving way under a loaded coal train, and killing about six men.

BLOOMINGTON, ILL.—The committee has directed the city engineer to prepare plans for a viaduct at Center St.

HENNEPIN, ILL.—A petition is being circulated for a bridge over the river and a branch of the Chicago, Rock Island & Pacific R. R., at an estimated cost of $15,000.

MAHOMET, ILL.—The county commissioners will soon be petitioned to build a bridge over the Sangamon River south of this place, at an estimated cost of about $5,000.

SHAWANO, WIS.—It is reported that the town of Richmond has voted to issue $2,750 in bonds to aid in the construction of two iron bridges.

SHEBOYGAN, WIS.—It is stated that the N. P. Glann Construction Co. is receiving bids for constructing bridges for the Sheboygan, St. Paul & Central Ry. Co.

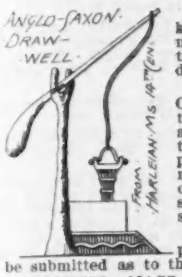
STANTON, NEB.—Bids are asked until Aug. 27 for constructing a pile bridge 80 ft. in length, and for a one-span bridge 110 ft. long, each bridge to be 14 ft. wide and 12 ft. above low-water mark. Louis Smithberger, County Clk.

ALBUQUERQUE, N. MEX.—The new bridge at Puerco, belonging on the Atlantic & Pacific Ry., has been destroyed by a cloudburst, according to reports.

STOCKTON, CAL.—Press reports state as follows: Plans for a new steel drawbridge that is to replace the wooden Southern Pacific structure that now spans the San Joaquin River between Lathrop and Tracy have been approved by the war department and will soon be sent to the eastern office of the railway com-

pany that bids may be obtained for the contract of building the steel superstructure. The new bridge will cost about $150,000. The drawspan, from pier to pier, in the present bridge is 160 ft., but in the new structure it will be 200 ft. On the easterly side of the river there will be two spans of 110 ft. each, and on the opposite side one span of 62 ft. The total length of the bridge will be 482 ft. The piers will be of masonry. The new bridge will be constructed on the site of the present structure, and a temporary bridge may have to be erected to accommodate the traffic while the new one is being constructed.

WATER-WORKS.



BELMONT N. H.—Chas. O. Judkins, Superintendent of the Belmont Aqueduct Co., writes us that the proposed extensions will be done by the town by day labor.

CONTOOCOOK, N. H.—G. A. Curtice, Chn. Com., writes us that the committee has been granted additional time in which to investigate the question of works; supply will be from a pond four miles distant. The plans will be completed this fall, and the construction commenced early in the spring.

WATERBURY, VT.—It is reported that estimates will soon be submitted as to the cost of works.

BELMONT, MASS.—W. C. Chenery, Town Clk., writes us that $8,000 of 30-year bonds have been sold for extensions, and the contract for the construction awarded to Little & Effie. Engr., E. A. W. Hammatt, 29 Pemberton Square, Boston.

BRADFORD, MASS.—At a special town meeting Aug. 12 it was voted to issue $81,000 in bonds to purchase the works and $50,000 for improving the plant.

PITTSFIELD, MASS.—Bids are asked by the city treasurer until Aug. 26 for the purchase of $90,000 of 4% water bonds.

ALBANY, N. Y.—The superintendent has reported estimates for new mains, to cost $27,200, and has recommended that a high-service reservoir be constructed and other improvements made.

BINGHAMTON, N. Y.—S. M. Gray, of Providence, has completed plans for the proposed new reservoir, estimated to cost $300,000 to $350,000.

BROOKLYN, N. Y.—Bids are asked until Sept. 10 for laying 48-in. pipe, etc., for section 1 of the additional pipe conduit, as stated in our advertising columns. Alfred T. White, Comr. Cy. Wks.

BROOKLYN, N. Y.—Bids are asked until Aug. 21 for furnishing and delivering a quantity of 6 to 48-in. water gates, as stated in our advertising columns. Alfred T. White, Comr. Cy. Wks.

BUFFALO, N. Y.—The board of public works has opened the following bids for four new boilers for the lower pumping station, the specifications calling for four Peck boilers with Hawley down-draft furnaces: Riter Bros., Buffalo, furnishing the boilers with the Hawley down-draft furnaces, $20,150; Lake Erie Boiler Works, Buffalo, boilers as per specifications, $20,750; boilers of its own design with Hawley furnaces, $20,500; its boilers with ordinary furnaces, $17,500. Farrar & Trefts, Buffalo, as per specifications, $27,850.

CANASERAGA, N. Y.—An election was held Aug. 10 to vote on an appropriation of $14,000 for works, according to reports.

DELHI, N. Y.—James Middlemist, Supt., writes us that 1,200 ft. of 3-in. pipe is being taken up and replaced by 12-in. pipe. This is the only work contemplated at present.

HEMPSTEAD, N. Y.—B. Valentine Clowes, Pres. Trustees, writes us that bids will probably be opened before Sept. 1 for constructing the proposed new works, estimated to cost about $45,000. Engr., L. Russell Clapp.

MOUNT MORRIS, N. Y.—Bids are asked until Aug. 22 for constructing works for the Craig Colony for Epileptics at Sonyea, as stated in our advertising columns. Consult. Engrs., Voorhees & Witmer, Buffalo. Engr., Newcomb Carleton, White Bldg., Buffalo.

NAPLES, N. Y.—Bids are asked until Aug. 29 for constructing works in this village, as stated in our advertising columns. The work will require about 6½ miles of pipe, 58 hydrants, etc. Engrs., Voorhees & Witmer, Buffalo; C. S. Lincoln, Pres. Comrs.

NEW YORK, N. Y.—Bids are asked by the department of public works until Aug. 23 for laying water mains in about 20 streets.

NIAGARA FALLS, N. Y.—At a special election Aug. 28 the taxpayers will vote on an appropriation of $30,000 for water-works extensions and $9,000 for a new bridge.

OWEGO, N. Y.—Geo. G. Robertson, Supt., writes us that the Owego Water-Works Co. is about to build a dam for a 62,000,000-gallon reservoir. The work will be done by day labor and not by contract.

PAWLING, N. Y.—The Wild Engineering Co. is reported to have discontinued work on the new water-works plant. It is stated that the contract, which was awarded at about $26,000, was a losing job.

PERRY, N. Y.—The proposition to issue bonds for works was carried at the special election, by a vote of 185 to 92.

SOLVAY, N. Y.—At an election Aug. 7 the citizens voted to issue bonds for works. The construction has already been commenced, as noted in our issue of Aug. 1.

CAMDEN, N. J.—Bids are asked until Sept. 3 for a new system, method or plan for furnishing the city with at least 20,000,000 gallons of good water a day, as stated in our advertising columns. Edwin Hillman, Chn. Com.

BELLEVUE, PA.—Fred W. Kiefer, Pres. Council writes us that the borough is considering the question of works, but has not decided upon any plan, and would be glad to hear from artesian water supply contractors.

ELIZABETHTOWN, PA.—Edgar B. Kay has been engaged by the Elizabethtown Water Co. to prepare plans for its proposed plant, which will include about five miles of mains, a reservoir, pumping station, etc.

PHILADELPHIA, PA.—Bids are asked until Aug. 20 for 30 and 48-in. pipe, special castings, pig lead, tapping machines, meters, trenching, etc. Thomas M. Thompson, Dir. Pub. Wks.

PITTSBURG, PA.—Contracts for four new pumping engines have been awarded to the Edward P. Allis Co., as noted under Contract Prices, and contracts for tubular boilers to Riter & Conley, at $50,077.

RICHLANDTOWN, PA.—The Richlandtown Water Co. was incorporated Aug. 2, with a capital stock of $1,000. Treas., C. Taylor Leland, Newtown, Pa.

SELLERSVILLE, PA.—The contract for constructing works, as advertised in Engineering News, has been awarded to E. S. Whitney, Allentown, Pa., at $23,803. The bids were as follows:

	Sec. 1.	Sec. 2.	Total.
Harrison & Bro.	$16,861	$11,859	$28,720
Howard E. Ahrens, Reading Pa.	16,833	8,669	25,502
Jones & Resser	20,439	11,643	32,082
E. S. Whitney, Allentown, Pa..	16,736	7,067	23,803
Malone & Bro., Hollidaysb'g, Pa.	26,379	7,269	33,648
John B. Foley, Philadelphia, Pa.	16,031	6,927	22,958
C. T. Moore	26,394	9,732	36,126
Owen Patterson, Baltimore	18,487	7,833	26,320
Lehigh Valley Const'n Co.	17,132	10,635	27,767
T. H. Regan & Co., Philadelphia	16,463	7,520	23,983

STRASBURG, PA.—Edgar B. Kay, Engr., Bellwood, Pa.; A. S. Harkness, Ezra Fritz, and Geo. Hensel are organizing a company to construct works at this place.

CULPEPER, VA.—W. Nalb is reported to have been engaged to prepare plans for works at this place.

PIEDMONT, W. VA.—It is stated that unless the mains are extended to Westernport, a private company will soon construct works to supply the residents of that place.

BIRMINGHAM, ALA.—M. Sloss writes us that the new works of the Artesian Water Co. will include a 50,000,000-gallon reservoir, with pumps, hydrants, etc. A supply of 8,000,000 gallons a day will be secured from artesian wells; hydrant pressure, 100 lbs.

JACKSONVILLE, FLA.—Robt. N. Ellis, Supt., has recommended the following improvements: The building of a 12-in. well, 950 ft. deep, about a mile north of the water-works, with pipe to the present reservoir; the putting in of two 5,000,000-gallon pumping engines with the necessary boilers; the enlarging of the present engine house to double its present size; the building of a 2,000,000-gallon reservoir, to be used as a fire reserve; the building of a stand-pipe, and the laying of 30 miles of mains with the necessary hydrants and valves.

TROY, ALA.—The contract for works is reported to have been awarded to Howard Neeley, of Chattanooga, Tenn.

McMINNVILLE, TENN.—Bids are asked until Aug. 20 for constructing works, according to reports. It is stated that the plant will include 6 or 8-in. mains, a 100,000-gallon tank and a 40 to 60-HP. steam engine. Address T. F. Stratton.——A. H. Faulkner, Cy. Recdr., writes us that a franchise has been granted to T. F. Stratton, but that he had not filed his acceptance of the same at the time of writing, Aug. 8; population, 2,000.

BLOOMVILLE, O.—The clerk of council writes us that the council is contemplating the construction of works, but that no definite steps have yet been taken; population, 900.

CINCINNATI, O.—The contract for the Mount Auburn tanks, for which bids were received a few weeks ago, has been awarded to L. Schreiber Son's Co., of Cincinnati, at $9,555.

COLUMBIANA, O.—Bids are asked until Sept. 2 for the construction of works estimated to cost $30,000. The plant will include two 750,000-gallon pumps, a 30 × 35-ft. storage reservoir, about 450 tons of pipe, 41 hydrants, a 30 × 18-ft. red cedar tank, a steel trestle 125 ft. high, boilers, etc. Engr., Wm. H. Ashwell; E. L. Roninger, Clk.

EAST CLEVELAND, O.—Edward Cook has submitted plans for works for the three villages of East Cleveland, Glenville and Collinwood, east of Cleveland; estimated cost, $80,000 to $100,000; E. D. Burton, Mayor.

MOUNT STERLING, O.—Bids will probably be received next month for the construction of works estimated to cost about $18,000. The bonds are to be sold Sept. 2. John W. Hanawalt, Clk.

NORWALK, O.—F. Christian, Cy. Clk., writes us that an election was to be held Aug. 13 to vote on an issue of $100,000 in bonds for a new water supply.

FOWLER, IND—The Fowler Water Co. has been incorporated with a capital stock of $15,000; directors, Chas. M. Siepner, John H. Brown, and Wm. T. Hapeman.

RUSHVILLE, IND.—Bids are asked until Sept. 17 for furnishing all materials and constructing works on a 25-year franchise plan, as described in our advertising columns. Engrs., Sanders & Porter, Columbia Bldg., Louisville, Ky. Wm. G. McVay, Cy. Clk.

LEWISTON, MICH.—J. H. Pinkerton, Clk., writes us that 5,000 ft. of pipe has been purchased from R. C. Baily, of Bay City, and the contract for pipelaying awarded to James Hurley & Son, of Bay City, at 6½ cts. per lin. ft. The work will commence soon, and be completed by Oct. 1. The plant will cost $3,000 to $4,000.

METAMORA, MICH.—J. L. Rossman, Village Clk., writes us that the water-works proposition was defeated at the recent special election.

CAMBRIDGE, ILL.—John H. Graton, Village Clk., writes us that the contract for boring an artesian well has been awarded to H. W. Cortes, of St. Louis, and that no other steps will be taken for works until the well is completed. The village has not voted to issue $25,000 in bonds, as stated in certain papers, and will not until a water supply is secured.

CHICAGO, ILL.—Bids are being received, according to press reports, for the extension of the old mile intake tunnel at the Chicago Ave. pumping station to the two-mile crib. The tunnel will be 6 ft. in diameter.

LAWRENCEVILLE, ILL.—Will Tracy, Cy. Clk., writes us that the only steps taken for works was the holding of an election July 20.

WARREN, ILL.—Bids are asked until Aug. 24 for the purchase of $7,200 of 5% 20-year water-works bonds, and until Sept. 3 for the construction of works, excepting the well and system of mains. The mains will be laid by special assessment and the contract awarded later. Bids will be received Sept. 3 for the water-works building, for a stone tower, a reservoir, and pumping machinery, as stated in our advertising columns. Preston T. Hicks, Cy. Engr.

CASSVILLE, WIS.—Otto Reinke, Village Clk., writes us that the trustees have adopted plans for works prepared by W. H. Knowlton, Cy. Engr., Dubuque, and bids will be received at once for the construction. At an election in July, $4,500 in bonds were voted for this purpose.

SHAWANO, WIS.—B. H. Garfield writes us that all the bids received Aug. 1 for a water supply and electric lights were rejected.

WATERTOWN, WIS.—Geo. C. Morgan, of Chicago, has been engaged to prepare plans and specifications for new works, and it is expected that the plans will be ready in about two weeks. The supply will probably be from artesian wells; population, 10,500. Theodore Prentiss, Chn. Com.

OSCEOLA, IA.—It is stated that works will soon be constructed at this place.

OXFORD, IA.—This town has voted to issue bonds for works.

REMSEN, IA.—Bids are asked until Aug. 27 for the construction of works. Plans may be seen in the town office, and also at the office of F. E. Wade, Sheldon, Ia.

SCHALLER, IA.—H. L. Leland, Recdr., writes us that the following bids were received Aug. 5 for constructing works:

*Challenge Wind Mill Co., Batavia, Ill.	$4,695
U. S. Supply Co., Omaha, Neb.	4,000
R. H. Allen, Early, Ia.	4,075
B. Schreiner, Des Moines, Ia.	4,372

* Awarded contract.

ALDEN, MINN.—Peter Hansen, Village Recdr., writes us that the contract for constructing works has been awarded to O. H. Olsen & Co., Stillwater, Minn., at $5,175. Fairbanks, Morse & Co., of St. Paul, bid $5,248, and Gustav Schneider, Blue Earth City, Minn., $4,986, without engines.

CLARKSON, NEB.—A press report states that this town has voted to issue bonds for works, which will be constructed at once.

CASPER, WYO.—Bids are asked until Aug. 24 for the purchase of $23,000 of water bonds. Geo. B. McCalmont, Mayor.

GRANITE, ORE.—The Granite Water Co. has been incorporated with a capital stock of $1,000, by L. L. Forrest, Fell, Niven and Grant Thorburg.

TORONTO, ONT.—The Georgian Bay Aqueduct Co. has submitted a proposition to the council offering to deliver 20,000,000 imperial gallons of water a day by gravity at high pressure for $600 a day, 1½ cts. per thousand gallons to be charged for all in excess of this quantity; contract to be for 50 years, after which the price will be determined by arbitration, or the city acquire the plant.

GARBAGE DISPOSAL.

CHICAGO, ILL.—Dr. John B. Hamilton, and Alderman Madden, who were sent to Allegheny, Pa., to investigate the Rider garbage crematory, have reported to the mayor in favor of this method of garbage disposal. The furnaces at Allegheny are capable of consuming 35 to 40 tons of garbage a day, and cost $8,600 to $10,000 each. About 15 would be required in this city, and it is suggested that the city secure the plans and advertise for bids for the construction of the furnaces, as the company offers to let the city build its own furnaces on payment of a royalty of $1,000 each.

PEORIA, ILL.—The railroad and harbor committee of the council has reported in favor of a garbage crematory, and the council is reported to have voted unanimously in favor of one.

OAKLAND, CAL.—In response to a request of the council, the health officer has submitted a report on the advisability of building a garbage crematory. The report recommends that an Engle crematory be constructed at a cost of about $15,000. It is estimated that the present cost of garbage removal is 70 cts. per capita, while under the proposed system it would be 30 cts.

SEWERAGE.

MEDFORD, MASS.—The commissioners received the following bids Aug. 10 for constructing 3,250 ft. of 4½-ft. brick sewer, with a 12-in. pipe underdrain; Engr., T. H. Barnes:

Charles R. Gow, Medford	$11,664
A. W. Bryne, West Medford	13,620
John Sheehan & Co., Lynn	17,846
Trumbull & Ryan, Boston	19,048
Edward McManus, Waterbury, Conn.	19,100

QUINCY, MASS.—The mayor has appointed the following board of sewerage commissioners: H. T. Whitman, one year; W. T. Shea, two years; P. R. Blackmer, three years.

TAUNTON, MASS.—Bids are asked until Aug. 17 for constructing and reconstructing pipe and brick sewers in certain streets. Luther Dean, Cy. Engr.; Henry A. Thayer, Pres. Comrs.

ALBANY, N. Y.—Bids are asked until Aug. 19 for constructing 18 to 6-in. pipe sewers in Central Ave.; two sureties of $5,000 each. Thos. J. Lanahan, Clk. Bd. Contract.

BATAVIA, N. Y.—The state board of health has approved plans for a system prepared by Emil Kuichling, of Rochester, and Joseph W. Holmes, of Batavia. This question was discussed some time ago, and is again being considered, as noted in our issue of Aug. 1, with more chance of success. D. W. Tomlinson, J. H. Bradish, John Day, Andrew Skelley, Committee.

BUFFALO, N. Y.—Bids are asked until Aug. 30 for constructing 12 and 10-in. pipe sewers in four streets. R. G. Parsons, Secy. Dept. Pub. Wks.

DUNKIRK, N. Y.—The Brooks Locomotive Works has applied to the council for a permit to construct at its own expense a 30 or 24-in. trunk sewer 2,000 ft. long in certain streets, at an estimated cost of about $6,000.——Plans have been prepared for about three miles of sewers. J. K. MacDonald, Cy. Engr.

KINGSTON, N. Y.—It is stated that the city clerk is to be directed to advertise for bids at once for constructing sewers in Wards 2 and 9.

ITHACA, N. Y.—The following bids were received Aug. 3 for constructing the fifth section of the sewer system; Ch. Engr., Henry N. Ogden; Roger B. Williams, Chn.:

W. H. Cookman, Niagara Falls, N. Y.	$14,433
Tmos. F. Moore, Buffalo, N. Y.	14,090
R. H. Bethel & Co., New York	12,197
James McCloud & Co., Williamsport, Pa.	14,141
Driscoll Bros. & Reed, Ithaca,	13,872
William Franklin, Buffalo.	15,594
Burns & Banks, Niagara Falls, N. Y.	17,750

The contract was awarded to R. H. Bethel & Co., of New York. The contracts so far awarded have been to James F. Moore, Buffalo; Burns & Banks, Niagara Falls; James McCloud & Co., Williamsport, Pa.; and R. H. Bethel & Co., New York.

MECHANICSVILLE, N. Y.—Bids are asked until Aug. 27 for constructing 50,000 ft. of 12 to 6-in. pipe sewers, as stated in our advertising columns. S. H. Hall, Pres. Comrs.; J. F. Terry, Clk. Comrs.

MOUNT MORRIS, N. Y.—The following bids were received Aug. 5 by Mrs. Chas. F. Wadsworth, Chn. Com., for constructing pipe sewers for the Craig Colony for Epileptics at Sonyea:

	Total.	Time, days.
H. W. Neff and A. Willard, Geneseo.	$6,620	90
J. W. Kelley and C. N. Ogden, Mt. Morris.	6,313	40
Dodge & McGregor, Buffalo, N. Y.	6,658	70
Whitmore, Rauber & Vicinus, Rochester.	6,751	40
Jas. Halahan, Rochester, N. Y.	6,961	60
Richmond & Miller, Buffalo, N. Y.	7,783	75
Lauer & Hagaman, Rochester, N. Y.	5,042	55
*Barney P. Smith, Rochester, N. Y.	5,738	45
Richard O'Leary, Niagara Falls, N. Y.	6,541	60

* Awarded contract.

PORT RICHMOND, N. Y.—Bids are asked by the joint board of commissioners until Aug. 27 for constructing the Jewett Ave. outlet sewer. Engr., O. T. Barrett; G. S. Brantingham, Chn. Joint Bd.

ROCHESTER, N. Y.—Bids are asked until Aug. 23 for constructing an outlet sewer in Richard St. Thos. J. Neville, Clk. Executive Bd.

CAPE MAY, N. J.—The council has engaged C. A. Gardner to make preliminary surveys for a system.

ELIZABETH, N. J.—Bids are asked until Aug. 30 for constructing about 2,000 ft. of 40 to 27-in. brick and 900 ft. of 18 and 12-in. pipe sewers. N. K. Thompson, St. Comr.

HARRISON, N. J.—Bids are asked until Aug. 20 for constructing a pipe sewer in Cleveland Ave.; check, $1,000. David Young & Co., Town Engrs.; John J. Scannell, Chn. Com.; B. P. Walsh, Town Clk.

JERSEY CITY, N. J.—Bids are asked until Aug. 20 for constructing 440 ft. of 15-in. pipe and 355 ft. of 24-in. brick sewers, and until Aug. 27 for constructing 3,720 ft. of 51 to 36-in. steel pipe for the Mill Creek main sewer, the latter work including 420 spruce or pine piles, 15,000 ft. B. M. pine, 12,000 cu. yds. earth filling, etc. John C. Kaiser, Chn. Com.; John M. Jones, Pres. Finance Bd.

NEWARK, N. J.—Ernest Adam, Engr., has been directed by the committee of the board of works to proceed with the preliminary arrangements towards the construction of the east branch sewer to drain the low-lying sections of what is known as the Neck. Consult. Engr., Rudolph Hering, New York.

ALTOONA, PA.—The council is considering an ordinance providing for the construction of a pipe and brick sewer for district 4, at an estimated cost of $60,000, although the citizens voted $98,000 for the purpose. Consult. Engr., Rudolph Hering. Harvey Linton, Cy. Engr.

PHILADELPHIA, PA.—Bids are asked until Aug. 20 for constructing drains in four streets; check, $500. T. B. Stubb, Health Officer.

SWATHMORE, PA.—The contract for constructing a system of sewers was awarded to Edgar B. Kay, of Bellwood, Pa., on Aug. 12, at $7,123. The itemized bids will be published next week.

CUMBERLAND, MD.—The committee has recommended that an engineer be engaged to prepare plans for improving the system.

WASHINGTON, D. C.—Bids are asked by the district commissioners until Aug. 18 for the construction of sewers, as stated in our advertising columns.

SPARTANBURG, S. C.—It is reported that an election will be held to vote on the question of issuing bonds for sewers.

JACKSONVILLE, FLA.—Robt. N. Ellis, Supt. W. W., has made a report on the sewerage plans submitted by Col. Geo. E. Waring, in November last, suggesting some alterations. He recommends that the board of trustees should buy all the pipe necessary and then award the contracts for constructing it in sections.

ALLIANCE, O.—It is stated that the clerk has been directed to advertise for bids for constructing a sewage disposal plant, as recommended by the engineer and for which the citizens voted July 20 to issue $20,000 in bonds. The plans provide for the construction of two buildings, one for the disposal works proper, and the other for the boiler room. Provision is also made for a storage room for the chemical ingredients to produce precipitation. The proposed cost of the improvement is $18,400.

CLEVELAND, O.—Bids are asked until Aug. 21 for constructing a sewer in Solon St. D. E. Wright, Dir. Pub. Wks.——Plans have been prepared for sewers in six streets. Samuel G. McClure, Secy. Bd. Control.

TIFFIN, O.—It is probable that plans and estimates for sewage disposal will be considered in the fall, as the question is now being discussed. Robt. W. Lysle, Cy. Engr.

YOUNGSTOWN, O.—The board of public works is considering the question of reconstructing the present combined system into a separate system, and also extending it. G. D. Hersey, Cy. Engr.

BAY CITY, MICH.—The board of public works has recommended the construction of a 39 × 26-in. brick main sewer in 14th St.

CRAWFORDSVILLE, IND.—The construction of a system is being considered.

HAMMOND, IND.—T. W. Kinser & Son, of Chicago, Ill., have been awarded the contract for constructing the North Side Calumet Ave. main sewer at $3.58 per lin. ft. W. F. Bridge, Cy. Engr.

SOUTH BEND, IND.—Bids are asked until Aug. 26 for constructing a brick sewer in Vistula Ave. L. A. Hall, Cy. Clk.

VALPARAISO, IND.—Bids are asked until Aug. 27 for constructing a 20-in. pipe outlet sewer 3,720 ft. in length. J. W. Halladay, Cy. Clk.

CHICAGO, ILL.—Bids are asked until Aug. 23 for constructing sewers in a large number of streets; check, $1,000. W. D. Kent, Comr. Pub. Wks.

KAUKAUNA, WIS.—The council has ordered the construction of a sewer in Metoxin Ave.

SALT LAKE CITY, UTAH.—Bids are asked until Aug. 22 for the right to use the sewage of the city for irrigating purposes, the right to include the use of 75 acres of land owned by the city at the sewer outlet. A. F. Doremus, Chn. Bd. Pub. Wks.

MARYSVILLE, CAL.—Bids are asked until Aug. 19 for a system of brick and pipe sewers. F. E. Smith, Cy. Clk.

FREDERICTON, N. B.—J. A. Ruel is making surveys for a system, estimated to cost $58,000, as noted in our issue of last week.

MANUFACTURING PLANTS.

RANGELEY, ME.—The erection of a steam mill in this village is said to be contemplated by A. D. Grover and A. E. Rogers.

SALEM, MASS.—It is reported that work will be commenced at once on the erection of the large knitting mill for George E. Brockway, of Cohoes, N. Y.

WORCESTER, MASS.—A large new mill is to be erected by Akers & Taylor on the site of the structure destroyed by fire on South Bridge road, according to press reports. The structure will be largely of iron, and will be provided with the latest machinery.

NEW LONDON, CONN.—A three-story addition is to be built for the New London Vise Works Co., which will be used as a manufactory of bicycles.

TROY, N. Y.—Plans for the reorganization of the Troy Steel & Iron Co. are in progress. It is stated that the erection of a new mill is contemplated.

ALEXANDRIA, VA.—The Consumers' Brewing Co. has been incorporated with a capital stock of $500,000, and a site has been purchased near the Aqueduct bridge, on which a large four-story brewery will be erected. Dennis Connell, Thomas Walsh and Robert R. White are among the incorporators.

BESSEMER CITY, N. C.—The large new building, erected for a cotton mill, but which has never been equipped on account of financial trouble, was last week sold to Stonewall Jackson Durham, of Dallas, N. C., representing a syndicate, and machinery will soon be purchased to equip the mill.

HENDERSON, N. C.—A $100,000 cotton mill company was organized at this place last Saturday. The mill will be built at once, and will be equipped with 8,000 spindles and other machinery, including an electric light plant. Pres., D. Y. Cooper; Secy., E. G. Davis.

MANTEO, N. C.—It is reported that a new ice plant of 12 tons capacity is to be established here by F. P. Gates, and that bids will be received for the necessary machinery.

STATESVILLE, N. C.—Geo. H. Brown, T. J. Allison, N. B. Mills, and others, of this place, will build a $100,000 roller flour mill at Buffalo Shoals, in Iredell county, N. C., near Statesville. The company will also build an iron bridge across the Catawba River.

WELDON, N. C.—Ex-Senator M. C. Butler, of Edgefield, S. C.; J. W. Wilson, of Raleigh, N. C.; Richard Arrington and John Arrington, Jr., of Petersburg, Va., composing, in part, the Roanoke Navigation & Water Power Co., of this place, will build a large corn mill, flour mill, and a cotton factory at this place, all to be operated by the water power which has recently been developed here.——The buildings for the knitting mills at this place are nearly completed, and will be equipped with machinery during the next month, and started up by Oct. 1. Other manufacturing plants to be located here are also projected.

TOCCOA, GA.—A company is being formed at this place to erect a $100,000 cotton mill, the equipment to include an electric light plant. W. R. Bruce and W. A. Mattheuson are among the principal stockholders.

MUNCIE, IND.—The Midland Steel Co. announces that work will soon be begun on a new addition to its plant. An iron building, 80 × 120 ft., will be erected and occupied by a three-roll high bar mill. This new department will assist the big rolls, as it will work the steel sheets down to a smaller size after they leave the blooming mill and before reaching the sheet rolls. It will add about 200 new hands to the 600 now on the pay-roll.

FERRIS, TEX.—The Atlas Pressed Brick Works are being erected at this place, at a cost of about $15,000. The office of the company is at 291 Main St., Dallas.

STREETS AND ROADS.

BOSTON, MASS.—It is stated that in a few days the awards will be made for widening and constructing Brighton Ave. The maximum price for the work has been fixed at $208,000.

BROCKTON, MASS.—The city engineer has recommended the paving of a number of streets with brick, at an estimated cost of $33,000.

NEWTON, MASS.—Plans and arrangements have been completed for constructing and widening Washington St. to a width of from 75 to 90 ft. for a distance of two miles, estimated to cost about $800,000, $386,000 of which will be for land damages.

ALBANY, N. Y.—Bids are asked until Aug. 19 for paving Third Ave. with granite blocks, two sureties of $5,000 each; and for paving Chestnut St. with brick, two sureties of $8,000 each. Thos. J. Lanahan, Clk. Bd. Contract.——Resolutions have passed the council paving two streets with granite blocks and brick, and for constructing drains in three streets.

BROOKLYN, N. Y.—The board of aldermen has decided to pave with granite Park Ave. from Hudson Ave. to Broadway, at a cost of $113,000, and De Kalb Ave. from Fulton St. to Broadway, at a cost of $174,000. In De Kalb Ave. the De Kalb Ave. R. R. Co. is to share in the expense of paving, paying about $45,000.

BUFFALO, N. Y.—The board of public works has received the following bids for paving: Rano St.—Buffalo Paving Co., asphalt, $14,071. Syracuse brick, $9,614; P. B. McNaughton, brick, $10,324. Woodlawn Ave.—German Rock Asphalt Co., $11,098; P. B. McNaughton, brick, $7,540; Barber Asphalt Paving Co., $11,130. Hopkins St.—German Rock Asphalt Co., $40,588; P. B. McNaughton, brick, $29,749; Barber Asphalt Paving Co., $40,101.

DUNKIRK, N. Y.—The city engineer has recommended the construction of 7,502 sq. yds. of paving and 3,963 lin. ft. of curbing, etc., in Smith St.

FRANKLIN, N. J.—Bids are asked until Aug. 16 for 12,000 cu. yds. of filling for the approaches to the stone culvert over Third River. Engrs., Watson & Wise, Passaic; address B. W. Spencer, Pres. Passaic & Newark Electric Traction Co.

MIDDLETOWN, N. Y.—Bids are asked by the city clerk until Aug. 21 for paving Wickham Ave.

MOUNT VERNON, N. Y.—Bids are asked until Aug. 26 for grading and macadamizing East Lincoln Ave. Elias G. Pease, Cy. Clk.

NEW YORK, N. Y.—Bids are asked by the commissioner of public works until Aug. 19 for paving portions of five streets with asphalt on the present stone block pavement, and until Aug. 23 for paving a portion of Manhattan Ave. with asphalt blocks, three with asphalt on concrete foundations, five with granite blocks, and for grading, flagging, etc., five others. William Brookfield, Comr. Pub. Wks.——Bids are asked by the department of public parks until Aug. 21 for 6,894 sq. yds. of granite block paving; 13,600 sq. yds. asphalt pavement on concrete foundation; 2,200 cu. yds. of concrete for foundation; 13,000 lin. ft. of curbing, etc.; 185,000 sq. ft. of asphalt pavement on rubble stone foundation, and 41,000 sq. ft. rock asphalt pavement, and gravel sidewalks, etc.

NEW YORK, N. Y.—Contracts for paving portions of Macdougal, Pitt, Suffolk, 40th and 58th Sts., about 42,000 sq. yds., with asphalt, have been awarded to the Fruin-Bambrick Construction Co., of St. Louis; New York office, 35 Broadway.——The "Tribune" states as follows: Defects in the construction of the Harlem Driveway have been brought to light by a report of Foster Crowell, Consult. Engr., who was requested by the park commissioners to make an expert examination a month ago. Mr. Crowell first finds fault with the masonry retaining wall in the first section, from 155th St. to High Bridge, because its outer face is vertical instead of leaning inward, and because the dimensions of the wall are lighter than they should be. Mr. Crowell then finds fault with the subways which go under the driveway, saying that the arches of the subways are beginning to crack, although they do not yet bear the full load to be laid on them. He recommends that the entire masonry of one subway be removed and rebuilt. On account of the fact that the subways were built under a change in the original specifications, it will be for the corporation counsel to decide if the contractor or the city will have to bear the cost of the alterations. The crib bulkheads in the first section of the driveway are so badly distorted and displaced that they ought to be rebuilt entirely. The estimated cost of the changes recommended is $76,000. J. D. Leary, the contractor, who did the work which is declared to be defective, has filed a statement with the park board declaring that defects in the work were caused by bad plans, not by the workmanship.

NIAGARA FALLS, N. Y.—Bids are asked until Aug. 16 for 1,970 sq. yds. of asphalt paving in Main St., check, $500. W. W. Read, Cy. Engr.; S. F. Arkush, Cy. Clk.

OSWEGO, N. Y.—The Warren-Scharf Asphalt Paving Co. has been awarded a contract for paving a section of one of the principal streets with sheet asphalt on the present block and cobblestone pavement. This is the beginning of a system of first-class pavements for this city. A steam road roller has also recently been purchased.

ROCHESTER, N. Y.—Bids are asked until Aug. 23 for paving portions of two streets with brick. Thos. J. Neville, Clk. Bd.——The following bids were received Aug. 2 by the executive board for paving Mortimer St.: Vulcanite Paving Co., $17,605; Rock Asphalt Paving Co., $17,442; Warren-Scharf Asphalt Paving Co., $17,293, awarded contract. Estimated cost, $18,200.

SYRACUSE, N. Y.—Bids are asked until Aug. 26 for paving four streets with asphalt, brick or sandstone blocks; check, $2,000. Henry C. Allen, Cy. Engr.; H. F. Stephens, Cy. Clk.——The following bids were received Aug. 6 for paving West Fayette St.: Brick. John Dunfee, $19,673, awarded contract; Louis B. Moore, bid informal and not opened; G. D. Grannis, Corning brick, $22,095; Homer & Co., $19,738. Asphalt of standard quality, Louis B. Moore, bid informal; John Dunfee, Alcatraz California asphalt, $23,571; Syracuse Improvement Co., Trinidad sheet asphalt, $24,371; G. D. Grannis, California asphalt, $23,621; Warren-Scharf Asphalt Paving Co., $24,740. Sandstone block: Homer & Co., $25,792, bid informal; Syracuse Improvement Co., $27,024; G. D. Grannis, $25,350.

YONKERS, N. Y.—Bids are asked until Aug. 26 for macadamizing Central Ave. John G. Peene, Mayor; John Pagen, Jr., Cy. Clk.

HARRISON, N. J.—Bids are asked until Aug. 20 for grading, curbing, etc. a portion of Fifth St.; check, $1,000. David Young & Co., Town Survs., Broad and Bank Sts., Newark; P. J. Cairns, Chn. Com.; B. P. Walsh, Town Clk.

JERSEY CITY, N. J.—Bids are asked until Aug. 20 for about 8,150 sq. yds. of Belgian block paving, 7,000 sq. yds. of macadamizing, 6,150 cu. yds. of earth excavation, 3,050 cu. yds. of rock excavation, etc., and until Aug. 27 for 3,026 sq. yds. of brick paving, 17,000 sq. ft. of flagging, 17,000 sq. ft. of granolithic paving, etc.; the latter work is in connection with the proposed steel viaduct in 13th St. John C. Kaiser, Chn. Com.

ALLEGHENY, PA.—The board of public works has decided to advertise for bids for repaving six streets.

WILLIAMSPORT, PA.—Bids will soon be asked for repaving Pine St. with brick.

KEY WEST, FLA.—At an election held Aug. 6 it was decided that the county issue $500,000 in bonds for building a roadway from this city to Key Largo, according to reports.

CINCINNATI, O.—Bids are asked until Aug. 24 for

improving portions of three avenues in Columbia township. Geo. C. Zimmermann, Clk. Comrs. Hamilton County.—Bids are asked until Aug. 28 for paving Pecan St. with brick and macadamizing Woodlawn Ave. A. P. Butterfield, Clk. Bd. Administration.

DAYTON, O.—Bids are asked until Aug. 22 for improving Foundry St., and until Aug. 29 for 900 sq. yds. of paving in Court St., two checks of $5,000 each. C. A. Herbig, Cy. Comptroller.

HAMILTON, O.—Bids are asked until Aug. 20 for paving Main St. with asphalt blocks. M. O. Burns, Cy. Clk.

NORWOOD, O.—Bids are asked until Aug. 17 for macadamizing two streets. Engr., J. M. Harper; W. E. Wichgar, Clk.

TROY, O.—Bids are asked until Aug. 29 for constructing the Maple Hill Cemetery road. B. Furnas, County Audr.

WARREN, O.—Bids are asked until Aug. 21 for 22,038 sq. yds. of brick paving. Homer C. White, Cy. Engr.; Albert E. Andrews, Cy. Clk.

DETROIT, MICH.—The committee has decided to readvertise for bids for paving Cadillac Square with asphalt. The Warren-Scharf Asphalt Paving Co. was the lowest bidder for paving this square, but the contract was not confirmed by the council.

LOGANSPORT, IND.—Bids are asked until Aug. 20 for improving 19th St. John B. Winters, Cy. Clk.

MICHIGAN CITY, IND.—Bids are asked until Aug. 26 for paving two streets with brick. Albert H. Leist, Cy. Clk.

INDIANAPOLIS, IND.—Bids are asked until Aug. 20 for 325 sq. yds. of brick paving in Alabama St., and until Aug. 22 for 6,271 sq. yds. of asphalt paving in Mississippi St., 83,000 sq. ft. of cement sidewalks, etc. Chas. C. Brown, Cy. Engr.

QUINCY, ILL.—The board of public works has rejected the bids for paving three streets with brick and has voted to readvertise for new bids.

MILWAUKEE, WIS.—The board of public works has rejected bids for paving Grand Ave. from 13th to 21st St. with asphalt, and has canceled the advertisement for paving the same street from 21st to 27th St. with the same material, and the entire work will be readvertised. The bids received Aug. 1 for paving the first section are noted under Contract Prices.

DES MOINES, IA.—Bids are asked until Aug. 23 for 2,000 sq. yds. of brick paving in 10th St. and 20,000 cu. yds. of grading in South Ninth St. Edward Wright, John Sherman, Bd. Pub. Wks.

DULUTH, MINN.—Mr. Lewis is making surveys for a new wagon road to connect New Duluth with Fond du Lac.

ST. PAUL, MINN.—The Warren-Scharf Asphalt Paving Co. has been awarded the contract for paving West Fifth St., at $25,968; Hennessy & Cox were the only other bidders, at $27,900. Estimated cost, $27,300.

OMAHA, NEB.—Bids are asked until Aug. 31 for 7,500 cu. yds. of grading in two roads in Douglas county. Fred J. Sackett, County Clk.

KANSAS CITY, KAN.—The council has voted to pave three streets with brick.

CLOVERDALE, CAL.—The Dry Creek Improvement Association has been organized to improve the road from this place to Dry Creek, a distance of 15 miles. Pres., Geo. J. Smith; Secy., R. E. Baer.

MISCELLANEOUS CONTRACTS AND SUPPLIES.

STEAM ROAD ROLLER.—Amsterdam, N. Y.—The council is reported as about to purchase a new steam road roller.

GAS PLANT.—Bennington, Vt.—The village trustees have granted Henry S. Jackson, of Boston, a franchise to build and operate a gas plant at this place.

CANAL IMPROVEMENTS.—Albany, N. Y.—Bids are asked until Aug. 17 for nine contracts, and until Aug. 20 for three contracts for improvements of state canals. Geo. W. Aldridge, Supt. Pub. Wks.

FENDER SYSTEM.—Tompkinsville, N. Y.—Bids are asked until Aug. 21 for completing the fender system for the east face of the south wharf at this depot. 1st Lieut. Wm. E. Craighill, U. S. Lighthouse Engr.

RIPRAP STONE.—Baltimore, Md.—Bids are asked until Aug. 17 for furnishing about 2,100 tons of riprap stone and placing it in position in the vicinity of Maryland Point light station, Potomac River, Md. Capt. Eric Bergland, U. S. A., Lighthouse Engr.

REFRIGERATOR SYSTEM.—Lexington, Ky.—The Osborne Refrigeration Pipe System Co., of Chicago, has petitioned for a franchise. The company proposes to secure a franchise and then organize a local company with a capital stock of $150,000 to construct the system. Allen & Crimm, Attorneys, and W. R. Wallis, Engr., are the local representatives.

DREDGING, CEMENT, ETC.—Washington, D. C.—Bids are asked until Sept. 9 for dredging in Rappahannock River and Urbanna Creek, Va., and until Sept. 13 for furnishing and delivering cement, broken stone, steel I-beams, iron castings, etc., at Fort Washington, Md., and Fort Monroe, Va., as stated in our advertising columns. Maj. Chas. E. L. B. Davis, U. S. Engr. Office.

DAM.—Madison, Me.—It is stated that bids for the new dam to be erected just below the present one on the Kennebec River at Madison, for power for the Manufacturers' Investment Co., and the Indian Spring Woolen Mill Co., have been received from five different parties, including Waterville and Lewiston contractors. The new dam will be of stone, about 500 ft. in length, and an average height of 12 ft. The specifications allow stone for filling to be taken from the river-bed excepting the facings and top course, and as the old dam will be allowed to stand until the new one is completed the expense of construction is much lessened, the entire expense being about $20,000. Of this sum the Manufacturers' Investment Co. is to pay three-fifths of the expense of construction. The dam will be built upon a solid ledge of rock.

CONTRACT PRICES.

BRICK PAVING.—Middletown, N. Y.—The following bids were received Aug. 5 for paving East Main St. with brick: Thos. Harrington, 89 Church St., Jersey City, N. J., $1.87 to $2.08 per sq. yd. for paving and 35 cts. for excavating; Orr Bros., 184 First St., Newburg, N. Y., $1.96 to $2.26 and 38 cts.; Costello & Neagle, Elmira, N. Y., $1.97 to $2.16, including excavation; W. G. Horgan, 1696 Lexington Ave., New York, $2.21 and 30 cts.; E. A. Brown, Middletown, $1.79 to $2.03 and 38 cts. The Catskill brick was adopted, Thos. Harrington being the lowest bidder.

PARKWAY.—Boston, Mass.—Wm. T. Pierce, Engr., 13 Exchange St., writes us that the contract for constructing the Malden section of the Middlesex Fells parkway has been awarded by the metropolitan park commission to McClausker Bros., a broken stone surface of roadway being adopted. The bids were as follows:

Bids Received by the Metropolitan Park Commission for Constructing Malden Section, Middlesex Fells Parkway.

Bidder.	Earth grading, 33,400 cu. yds.	Rock grading, 25,400 cu. yds.	Drain. 8-in., 1,215 lin. ft.	Drain. 10-in., 1,745 lin. ft.	Drain. 12-in., 530 lin. ft.	Brick masonry, 50 cu. yds.	Rubble masonry in cement, 40 cu. yds.	Rubble masonry dry, 800 cu. yds.	Gutters, 1,350 sq. yds.	Edgestone, 1,110 sq. yds.	Stone surfacing, 27,000 sq. yds.	Gravel surfacing, 27,000 sq. yds.	Gravel walks, 5,700 sq. yds.	Loam surface, 15,500 sq. yds.	Total with stone surfacing of roadways.	Total with gravel surfacing of roadways.
McCusker Bros, Waltham	$0.35	$1.25	$0.28	$0.34	$0.40	$12	$4.50	$2.00	$0.25	$1.00	$0.25	$0.20	$0.10	$0.07	$55,968	$54,588
W. H. Magee, West Newton.	.30	1.50	.40	.50	.60	16	3.00	1.50	.60	1.50	.50	.40	.40	.30	74,371	71,611
R. A. Malone & Sons, Boston.	.40	1.25	.50	.60	.70	14	5.00	4.00	1.00	.90	.35	.45	.45	.20	66,909	69,669
H. P. Nawn, Boston	.58	1.60	.25	.35	.45	14	5.00	4.00	.80	1.15	.52	.47	.25	.02	81,708	80,328
T. F. Maney & Co., Quincy Pt.	.57	1.10	.30	.35	.40	13	4.50	3.00	.35	.90	.30	.20	.25	.15	63,397	60,637
Thomas Gavin, Watertown*	.40	1.35	.35	.45	.60	12	3.00	2.00	.50	1.20	.45	.20	.20	.10	67,615	60,715
T. J. Kelley, Brookline	.48	1.50	.40	.50	.60	12	4.00	3.00	1.00	.75	.40	.25	.20	.20	74,931	70,791
Neill McBride, Brighton	.44	1.60	.40	.40	.40	13	3.50	2.00	.75	1.20	.50	.50	.25	.40	81,891	81,891

* Combined bid of Thos. Gavin, Watertown; Pat. Grace, Brighton, and Michael J. O'Hearn, Brookline.

CAST IRON PIPE.—Jersey City, N. J.—W. W. Ruggles, Ch. Engr. Water Bd., writes us that the contract for 3,600 lengths of 20 to 4-in. cast iron water pipe has been awarded to John Fox, of New York, at $22 per gross ton, and the contract for laying the pipe to John Hopkins, at 55 to 20 cts. per lin. ft.

GRANITE BLOCK PAVING.—Mobile, Ala.—We are informed that the following bids were received Aug. 1 for paving Commerce St. with granite blocks on 6 ins. concrete foundation: J. N. Hazlehurst & Co., 414 Marcus Block, Atlanta, Ga., $2.97 per sq. yd; Mobile Paving Co., Mobile, Ala., $2.72½. Chas. E. McLean, Chu. St. Com.

ASPHALT AND BRICK PAVING.—Milwaukee, Wis.—Local papers state that the following bids were received Aug. 1 for paving Grand Ave., from 13th to 21st Sts., with asphalt: Wm. Forrestal, $1.97 a sq. yd.; James Markey, $1.93; Western Paving Co., $2.14; Warren-Scharf Co., $2.04; Western Bermudez Co., $2.20. The bids for paving Mason St., from East Water to Milwaukee St., with brick were as follows: William Forrestal, $1.37; H. Vogt, $1.65; T. F. Richard Co., $1.70; J. J. Crilley, $1.49 and $1.40; James Markey, $1.61; R. J. Hickey, $1.69; James O'Donnell, $1.79; Casgrain & McDonald, $1.77 and $1.69; Campbell & Denver, $1.40, $1.42 and $1.36; E. E. Naugel, $1.80; John O. Jones, $1.77; J. H. Kearney, $1.87. The prices for repairs were about the same, one being as low as $1.30. All bids were rejected owing to a technicality, and the work will be readvertised.

MACADAMIZING.—Indianapolis, Ind.—We are informed that contracts for macadamizing Capitol Ave. have been awarded the Indiana Bermudez Co. for Berlin granite surface, stratified limestone curb, and a stone gutter at least 25 ins. wide. One section is let at $5.50 a lin. ft. of each side of the street, other bids ranging from $4.48 to $10.02, according to material to be used and estimates of cost of work and of maintenance for five years under the specifications. The section is 3,474 × 45 ft. and has 18,416 sq. yds. of broken limestone foundation averaging 7 ins. in depth, 18,060 sq. yds. of granite surface, averaging 3 ins. in depth, 6,722 ft. of stratified limestone curb and about the same amount of gutter stone, 766 ft. of granite round corners, 11 catchbasins, 48 inlets, 1,252 ft. of double walk stone at street and alley crossings. The second section was let at $4.81 a lin. ft. of each side of the street, other bids ranging from $3.94 to $6.58. The section is 4,979 × 40 ft. and has 22,301 sq. yds. of limestone foundation, 21,955 sq. yds. of granite surface, 9,608 ft. of straight curb, 565 ft. of round corners, 3 manholes, 21 catchbasins, 80 inlets, 70 ft. of 15-in. drain, 425 ft. of 12-in. drain and 1,247 ft. of double walk stone.

PUMPING ENGINES.—Pittsburg, Pa.—The following bids were received Aug. 9 for two 12,000,000-gallon capacity vertical compound pumping engines for the Brilliant pumping station and two vertical triple-expansion pumping engines of 5,000,000 gallons capacity for the Herron Hill station:

	Brilliant.	Herron Hill.	Total.
*Holly Mfg. Co., Lockport	$147,975	$47,300	$195,275
Groshon H. D. P'g Eng. Co.	160,000	48,000	208,000
*E. P. Allis Co., Milwaukee	159,400	51,000	210,400
H. R. Worthington, N. Y.	167,750	67,500	235,250
Snow St'm Pump Co., Buffalo	189,900	75,732	265,632

* Our correspondent writes that the Holly Mfg. Co. is finishing two 10,000,000-gallon engines at Brilliant station, and is nearly a year behind on the contract, and the contracts for these engines have been awarded to the E. P. Allis Co.

BRICK PAVING.—Springfield, Ill.—Contracts for paving with brick have been awarded as follows: Henry Nelch, at $1.18, $1.19 and $1.20 a sq. yd.; Patterson & Striffler, at $1.18; Talbot Paving Co., at $1.19.

DREDGING.—Port Jefferson, N. Y.—The contract for dredging about 27,000 cu. yds. of material from the channel at the inlet to Port Jefferson Harbor has been awarded to the Hartford Dredging Co., Hartford, Conn., at 26 cts. per cu. yd., according to reports, the highest of five bids being 32 cts.

ASPHALT AND STONE PAVING.—Newark, N. J.—The board of works has awarded contracts as follows: Paving Washington St., from Central Ave. to Market St., with granite blocks on concrete, to John F. Shanley, at $2.84 a sq. yd.; Wright St., from Broad St. to Clinton Ave., with asphalt, to Barber Asphalt Paving Co., $2.69 a sq. yd., and for paving Clifton Ave., from Fifth to Bloomfield Ave., at $2.70.

HYDRANTS AND VALVES.—Jersey City, N. J.—We are informed that W. W. Farrier was the lowest bidder for 4, 6, 8, 10, 12, 16, 20 and 36-in. valves, at $6.49, $9.82, $16.21, $27.25, $37.57, $59.80, $83.93 and $469.20, respectively, and for hydrants at $29.40 for 2½-in. outlet and $30.90 for 5-in. outlet.

BRICK SIDEWALKS.—Gloucester, Mass.—The committee on highways has received the following bids for laying and repairing brick sidewalks in Main St.: Wm. McElmy, Boston, 27 cts. per sq. yd.; Wm. M. Lane, 34 cts. (awarded contract); Jacob Tucker, 80 cts.; Benjamin Marshall, 75 cts.; William Jackman, 41 cts., and 43 cts. for herring bone work; Eli Jackman, 45 cts.

BRICK PAVING.—Albany, N. Y.—The contracts for paving portions of Park and Irving Sts. with vitrified brick have been awarded to T. Henry Dumary, the bids being as follows:

Quantities.		T. H. Dumary, $2,795.	E. F. Dillon, $3,046.	H. I. Vandenburg, $3,503.	P. K. Reilley, $2,929.	P. H. Reynolds $3,414.
Park St.:						
Brick, granite curb,	871 sq. yds.	$2.06	$2.29	$3.17	$2.30	$2.60
" con. crb & gut.	776 " "	2.06	2.29	....	2.30	2.60
6-in. gran crb, strght	842 lin. ft.	.95	.98	.65	.90	1.10
6-in. " circlr	6 " "	.95	1.10	.65	1.00	1.25
6-in. con.crb.& gut.	848 " "	....	....	1.55	....	1.25
Curb relaid*	79 " "	.40	.25	.35	.40	.30
Relaying pavement or crosswalk	40 sq. yds.	.50	.25	.10	.25	.25
Relaying flags or brick walks	1,200 sq. ft.	.03	.05	.05	.03	.05
New brick sidewalk	1,030 " "	.07	.09	.06	.05	.07
New flag sidewalk	250 " "	.14	.15	.15	.13	.20

* Cement on concrete.

Bids for Paving Irving St., Albany, N. Y., with Brick.

Quantities.		T. H. Dumary.	Homer & Co.	Peter Callanan	Ed. T. Dillon.	H. J. Vandenburg.	P. K. Reilley.	P. H. Reynolds.
Brick pavement		$2.21	$1.92	$2.13	$2.23	$2.94	$2.30	$2.50
Blue-stone curb, straight	1,290 lin. ft.	.50	.85	.75	.75	.79	.79	.80
Blue-stone " circular	12 " "	.50	1.05	.80	.90	1.00	1.00	.80
Curb relayed	15 " "	.40	.30	.25	.20	.35	.25	.10
Flagstone sidewalk	3,530 sq. ft.	.16	.16	.14	.15	.15	.14	.14
Brick sidewalk	4,230 " "	.06	.07	.07	.05	.06	.07	.06
Flag or brick relayed	1,550 " "	.03	.10	.04	.35	.05	.03	.03
6-in. vitrified pipe	228 lin. ft.	.15	.15	.75	.25	.45	.40	.48
Relaying granite	20 sq. yds.	.50	.35	.25	.58	.20	.25	.20
6-in. one-eighth bend on vitrified pipe	19.	.30	.25	.60	09	.50	.35	.45
Total		$5,749	$5,804	$6,046	$6,550	$7,516	$6,321	$6,685

HYDRANT COVERS.—Buffalo, N. Y.—Bids received Aug. 7 for 700 or more hydrant covers and 100 extension cases were as follows: Kellogg Steel & Iron Co., Buffalo, covers, $3.694; cases, $99. C. F. Ernst, Buffalo, $3.72 for each cover and 84 cts. for each case; Riter Bros., Buffalo, $4.33 and $1.35; Cleveland Stamping & Tool Co., Cleveland, $4.25 and $1.35; Jacob Sackmann, $4.37 and 60 cts.; C. F. Ernst will get the contract.

ASPHALT PAVING.—Brooklyn, N. Y.—Bids have been received for about $60,000 worth of asphalt paving, the lowest prices ranging from $1.38 to $1.49 per sq. yd. Of the eight contracts, Cranford & Co., of Brooklyn, were the lowest bidders on six and the Fruin-Bambrick Construction Co., of St. Louis, on two.

The bids for the repaving of South Ninth St. were as follows: Fruin-Bambrick Construction Co., $17,974, or $1.39 a sq. yd.; Cranford & Co., $18,552; E. J. McKeever & Bro., $18,510.

LEVEES.—Rock Island, Ill.—The following bids were opened by Lieut.-Col. W. R. King, U. S. Engineer Office, Aug. 5, for the construction of levees between Flint Creek and the Iowa River; (1) being for medium height for entire distance and (2) for full height for about 17 miles:

	Earthwork, 700,000 cu. yds.			
	1.		2.	
Bidder.	Per cu.yd.	Total.	Per cu.yd.	Total.
J. Breheny & Sons, Keokuk, Ia.	$0.1225	$85,750	$0.1150	$80,500
McManus & Joyce, Keokuk, Ia.	.1150	80,500	.1100	77,000
J. C. Lee, Council Bluffs, Ia.	.1600	112,000	.1600	112,000
A. T. Dankwardt, Burlington.	.3250	227,500	.2850	199,000
J. J. McCaughey, Summit, Ill.	.1200	84,000	.1274	89,180
Jones & Strickler, Keokuk, Ia.	.1138	79,660	.1038	72,660
Edwards & Walsh Const'nCo.	...	.....	.1300	91,000
Paul Katz, Omaha, Neb.....	.1070	74,900	.0970	67,900
W. J. Dull, Arcanum, O.....	.1375	96,250	.1350	94,500
Casgrain & McDonald, Chicago	.1030	72,100	.1045	73,150
Murray Bros., Cedar Rapids, Ia.	.2000	140,000	.1700	119,000
Mallory, Cushing & Co., Omaha.	.1000	70,000	.1040	72,800
N. Young, Burlington, Ia.....	.1400	98,000	.1350	94,500
M. H. King, Des Moines, Ia.	.0800	56,000	.0818	57,260
J. H. McTighe & Co., Memphis.	...	.....	.1500	105,000
E. Phelan, Omaha, Neb.....	...	.....	.1450	101,500
C. H. Breyman & G. W. Tonson, Toledo, Ohio	.1600	112,000	.1450	101,500
W. F. Callahan, Omaha, Neb.	.0840	58,800	.0840	58,800
M. Jennings & Co., Memphis.	.10875	76,125	.11375	79,625
P. McDonnell, Duluth, Minn..	.1050	73,500	.0990	69,300
Halvorson, Richards & Co., Minneapolis, Minn.	.1100	77,000	.1100	77,000

INDUSTRIAL NOTES.

THE MILTON CAR WORKS, of Milton, Pa., has an order for 250 coal cars for the Beech Creek R. R.

THE HUNT AIR BRAKE CO., of Pittsburg, Pa., is introducing a new form of air-brake for street cars.

HUGH RAMSAY, of Perth Amboy, N. J., is building large hopper suction dredge for P. Sanford Ross, of Jersey City, N. J.

THE INDIANA SHALE BRICK CO., of Anderson, Ind., will build a plant having a daily capacity of 25,000 paving brick.

THE ANNISTON PIPE & FOUNDRY CO., of Anniston, Ala., has a contract for cast iron pipe for the waterworks at Tokio, Japan.

THE MUNCIE ROOFING WORKS, of Muncie, Ind., is building a steel and brick factory to replace the one recently destroyed by fire.

THE PITTSBURG LOCOMOTIVE WORKS, of Pittsburg, Pa., has an order for 10 ten-wheel engines for the Lake Shore & Michigan Southern Ry.

THE JACKSON & SHARP CO., of Wilmington, Del., has built several electric motor cars for the Burlington & Mount Holly branch of the Pennsylvania R. R.

THE PITTSBURG STEEL CASTING CO., of Pittsburg, Pa., has placed a contract for a steel frame building, 120 x 225 ft., to contain an open-hearth plant.

THE ILLINOIS STEEL CO., of Chicago, Ill., is adding a galvanizing plant to its sheet mills at Hammond, Ind., and will manufacture both black and galvanized plates.

THE PENITENTIARY FOUNDRY, of Rusk, Tex., has the contract for the water pipe for Austin, Tex. The ore is obtained in Cherokee county, and worked at the Rusk furnaces.

THE CARNEGIE WIRE NAIL MILLS at Beaver Falls, Pa., have been purchased by the Consolidated Steel & Wire Nail Co., of Chicago, for $725,000, according to a press report.

THE CONSOLIDATED BARB WIRE CO., of Lawrence, Kan., will add to its plant a wire mill and wire nail mill, each 100 x 150 ft., the latter containing 50 nail and spike machines.

THE BARNEY & SMITH CAR CO., of Dayton, O., has built two dining cars for the New York, Chicago & St. Louis R. R., and is at work on several orders for electric cars and freight cars.

THE CHAMPION STEAM JOINT REAMER & GRINDER CO., of 75 Strand St., Rondout, N. Y., is introducing a reamer and grinder invented by F. Brandes. Mr. J. H. Jones is Manager.

THE WEIMER MACHINE WORKS, of Lebanon, Pa., have delivered to the Rosena Furnace, at New Castle, Pa., a blowing engine with steam cylinder 50 x 60 ins., and blowing cylinder 96 x 60 ins.

THE DOMINION BRIDGE CO., of Montreal, Que., is building a lattice-girder bridge of 160 ft. span, to carry the extension of the Ottawa & Gatineau Ry. over the Pickanock River near Wright, Que.

THE CENTRAL STAMPING CO.'S plant at Newark, N. J., was destroyed by fire Aug. 11, causing a loss of probably $500,000, on which the company carried $250,000 of insurance. About 480 persons were employed.

THE ATLAS IRON CONSTRUCTION CO., of 41 Park Row, New York, has had Henry C. Williams, President, appointed receiver in proceedings for a dissolution of the company; assets, $78,500; liabilities, $53,500.

THE H. C. FRICK COKE CO. proposes to build its own cars used for the transportation of coke throughout the country. Car shops are now being erected at Everson, Pa. When completed, over 150 men will be employed.

THE CHAPLIN & FULTON MFG. CO., of Pittsburg, Pa., is introducing the Rodgers cylinder packing, and has recently received orders from the Carnegie Steel Co. for this packing for two 44-in. and two 30-in. cylinders.

THE ATLANTIC WORKS, at Sharon, Pa., and the Greenville Rolling Mill, at Greenville, Pa., both owned by P. L. Kimberly & Co., and which have been idle for several years, are reported as to resume operations within a few days.

THE YORK JAIL WORKS, of Portsmouth, O., has secured the contract for the construction of the jail cells for the new jail at Houston, Tex., to cost about $35,000. Work has been commenced on it, and 75 men are given employment.

THE MORRIS MACHINE WORKS, of Baldwinsville, N. Y., has established an office at 20 Cortlandt St., New York city, which is under the management of Hungerford Bros. & Co. Centrifugal pumping machinery is a speciality of this firm.

THE ASHLAND IRON & STEEL CO., of Ashland, Wis., is constructing a pier extending 2,000 ft. into Chequemagon Bay, an arm of Lake Superior, for loading pig iron direct from the Hinkle furnace. This will be a gravity track from the furnace.

THE J. W. FOWLER CAR WORKS, of Elizabeth, N. J., were put up at auction Aug. 8. The works cover 37 city lots, and have brick shops fitted with modern machinery. They were started only a few years ago for the construction of street railway cars.

THE PAGE WOVEN WIRE FENCE CO., of Adrian, Mich., is adding a new engine house and boiler room, and will equip its plant with new machinery throughout, to meet the increased demand for its woven wire fence. Over 30 railways are now using this fence.

THT RELIANCE MACHINE & TOOL CO., of Cleveland, O., is reported as intending to remove its works to East Moline, Ill., and to change its name to the East Moline Engine & Tool Co. The company manufactures gas and steam engines, heating and lighting plants, etc.

THE FALK MFG. CO., of Milwaukee, Wis., is castwelding the rail joints on some of the lines of the National Ry., St. Louis, Mo., and the West Chicago, Chicago City and Cicero & Proviso street railways. The Falk system makes a continuous rail, and has been described in our columns.

THE FRUIN-BAMBRICK CONSTRUCTION CO., of St. Louis, has opened an office at 35 Broadway, New York, and has just been awarded contracts for about 42,000 sq. yds. of asphalt paving in five streets in New York city, and was the lowest bidder for several similar contracts in Brooklyn last week.

THE NEPTUNE METER CO., 253 Broadway, New York city, is calling attention to the advantages of the Trident meter in point of freezing. It states that this meter cannot be internally distorted if partially frozen, and can be damaged to a fixed amount only when frozen solid and ruptured. John Thomson is vice-president and engineer of the company.

THE GREAT WESTERN FILE CO. has been organized with a capital stock of $400,000 to operate the Western File Works, Beaver Falls, Pa., which it has purchased from the Economy Society. The company is said to be a branch of the Nicholson File Co., Providence, R. I. The plant sold for about $200,000, and cost $750,000. It has been idle for three years.

JOHN J. WILLIAMS, of Thurlow, Pa., has just completed a contract for the Dupont Powder Co., at Thompson Point, N. J., for furnishing and laying a line of 6-in. ball joint pipe in the Delaware River for a distance of 110 ft., and to a depth of 26 ft. There is a crib resting on the bottom, and the end of the pipe is secured on top of the crib so as to prevent the rubbish from being drawn in. He has also laid several lines of suction pipe for different works at Chester, Pa.

THE YOUNGSTOWN BRIDGE CO., of Youngstown, O., has been awarded the contract for five bridges on the G. A. & C. R. R., consisting of 10 spans, mostly pin-connected trusses, and two plate-girder spans. This company has the contract also for 11 spans for the L. S. & M. S. R. R., three bridges for the Valley Ry. in Ohio; one span for the N. Y., L. E. & W. R. R., work for the A. C. & I. Ry., a 90-ft. girder span for the Baltimore City Passenger Ry. Co., besides a large amount of structural work.

T. W. KINSER & SONS, general contractors, of Chicago, Ill., have removed their offices to 609, 613 Chicago Stock Exchange Building. They have recently been awarded a contract for macadamizing streets at La Grange, Ill. Among contracts recently completed by them is a complete sewerage system and paving and macadamizing at Hammond, Ind., at a cost of $180,000; paving at Terre Haute, Ind., costing $30,000, and the landscape and surfacing work at Jackson Park, Chicago, for the South Park Commissioners.

THE AUTO-PNEUMATIC RAILWAY SIGNAL CO., of Rochester, N. Y., elected the following directors for the ensuing year at the annual meeting of the stockholders recently held at the company's office at Jersey City, N. J.: John N. Beckley, George W. Archer, Samuel D. Lee, George Weldon, George Moss, Thomas A. Smyth, J. H. McCartney and W. F. Carlton, of Rochester, N. Y., and B. W. Spencer, of Passaic, N. J. The new officers are: Pres., John N. Beckley; Vice-Pres., George Weldon; Secy., T. A. Smyth; Treas., George Moss.

THE PITTSBURG STEEL & IRON MFG. CO., of Pittsburg, Pa., recently incorporated, purchased the old Moorehead, McCleane & Co. mill, in Soho, a few weeks ago, and has a large force of men at work getting the mill in running order again. One furnace that had been idle for four years was put in blast Aug. 12, and it is expected that 2,000 men will be employed within two weeks. James McKean, Col. Jas. Andrews and Wm. Andrews, of Pittsburg, are among those interested. C. F. Stewart, of Cleveland, O., is to be manager of the mill.

NEW COMPANIES.—Marsden Celluloze Co., Philadelphia, Pa.; $1,000,000; George S. Graham, Edwin F. Glenn and Henry G. Goodrich.

Reading Tin Plate Co., Reading, Pa.; $20,000, with $2,000 paid in; Treas., Lewis Crater.

Haussman Pipe Co., Syracuse, N. Y.; $4,000; Robert Haussman, August Haussman, of Syracuse, and others.

Monroe Stone Co., Monroe, Mich.; $12,000; Frank C. Storms, Alex. T. Navarre, James I. Roberts, and others.

Ouachita Power Co., Little Rock, Ark.; $200,000; Pres., J. C. Hunzick; Secy., J. J. Walker; Treas., R. Murray.

Dake Engine Co., Grand Haven, Mich.; $60,000; George R. Wyman, W. P. Wyman, J. P. Armstead, and others.

Sibley Quarry Co., Fenton, Mich.; $200,000; James A. Church, E. Dwight Church, Jr., and Albert Stearns and others.

John J. Foster Gas Works, Greenville, Mich.; $20,000; John J. Foster, J. A. Foster, Minerva H. Foster, and others.

Peckover Improved Stone Saw Co., Philadelphia, Pa.; $50,000; James Peckover, Humphrey D. Tate and Thomas J. Ryan.

Guadaloupe River Navigation & Improvement Co., Victoria, Tex.; $50,000; John A. McFadden, T. D. Wood and others.

Standard Car Seat & Equipment Co., Jersey City, N. J.; $25,000, with $1,000 paid in; Geo. H. Ford and F. B. Baird, Brooklyn, N. Y., and Chas. N. King, Jersey City.

American Power & Tide Wheel Co., San Francisco, Cal.; $900,000, with $1,000 paid in; Charles Boone, Marcus S. Leve, A. H. St. Marie and others, of San Francisco.

Metropolitan Asphalt Paving Co., New York, N. Y.; $200,000; Thomas H. Thomas, Paul D. Cravath, John W. Houston, Edward H. Brush, and William M. Coleman, of New York city.

Old Dominion Construction Co., Jersey City, N. J.; $500,000, with $1,400 paid in; Elijah W. Sells and Charles W. Haskins, of New York city, and Albert A. Wilcox, of Paterson, N. J.

Minnesota Co., New York, N. Y.; $250,000, with $500 paid in; mining and lumbering; George B. Morris and Jos. W. Woolfolk, of New York city; Thos. G. Hillhouse, of Yonkers, N. Y.

Gold Spring Mining Co., Tuolumne, Cal.; $10,000, with $1,714 paid in; mining, irrigation and domestic water supply; Travers O. Connor, Aaron Morgan and Frank McPherson, Columbia, Cal.

North New York Improvement Co., New York city; sewers, streets, land reclamation, etc.; $15,000; William H. Duncan and Robert E. Holden, of New York city; Hanson S. Webster, of Brooklyn, N. Y.

Callanan Road Improvement Co.; to construct macadam and telford roads and to operate stone quarries; $100,000; Peter Callanan and Philip Scharbauer, of South Bethlehem, Pa.; John N. Briggs, of Coeymans, N. Y., and Charles D. Hammond and Meyer Nussbaum, of Albany, N. Y.

New Jersey Automatic Fuel Generator & Burner Co., 207 Washington St., Jersey City, N. J.; $100,000, with $20,000 paid in; to manufacture and sell the Elkins vapor fuel generator and burner; W. C. Mainland, Morris Park, N. Y.; John P. Craighead, Jersey City, N. J.; Ira S. Elkins, 136 Liberty St., New York city.

128 BIDS RECEIVED.

Morristown, N. J., Aug. 3, 1895.

Engineering News Publishing Co.,
New York City.

Gentlemen: We received 128 bids on our road work, and the number of inquiries was about the same. We had applications from as far as Canada, from Illinois and from Spokane, Wash.

Yours truly,
J. C. WHITE, County Clerk.

MORE THAN 150 REPLIES were received, an engineer writes us, from a recent insertion of a water-works advertisement in Engineering News.

THEY DID NOT ADVERTISE IN ENGINEERING NEWS.

In our Construction News items Aug. 8 we noticed that Cape Vincent, N. Y., received only three bids for constructing a complete system of waterwork, at $22,276, $28,508 and $30,231, according to statements in other papers. This work was advertised only in daily and local papers. A short advertisement in Engineering News would have cost only a few dollars and, bringing the work to the attention of nearly every prominent water-works contractor in this country, might have saved several thousand dollars on the contract.

The city of Marion, O., has opened bids for 15,152 sq. yds. of brick paving. Only two bids were received. A short advertisement, costing only a few dollars, in Engineering News might have saved this city a considerable sum of money on this contract.

Note—Brick paving contracts advertised in Engineering News, Waukegan, Ill., April 2, 15,300 sq. yds., received 30 bids; July 15, 10,365 sq. yds., received 10 bids; also Lorain, O., July 25, received 17 bids, as noted under Contract Prices, Aug. 8.

A GOOD INVESTMENT.

If you want to award contracts at the lowest possible prices, invest a few dollars in an advertisement in Engineering News. There is positively no method more efficient nor more economical for securing desirable competition for supplies or construction than a short advertisement in these columns. About every prominent contractor and every leading manufacturer of contractors' supplies read Engineering News.

WE WANT.

We want more news from your vicinity. We want more news items in regard to projected work in which you are interested. We want you to consider the advisability of sending us more news items for our Construction News columns.